Industry and Power

November 1954

Smoke Pollution
Chrysler engineers have run tests on a number of dust collectors and now release the results..51

Clean-Up Waste Water
A new waste treatment plant at National Supply takes out mill scale, oil, grease, dirt, and sand, discharging clean water into the Ohio River 55

What Overfire Air Can Do
An experienced power plant consultant tells how to install overfire air jets 58

Insulation vs Humidity
Insulation will solve problems of humidity control 62

LP Gas for Standby
LP stands for "Loss Protection" in this installation at Brown-Lipe-Chapin Division of General Motors 64

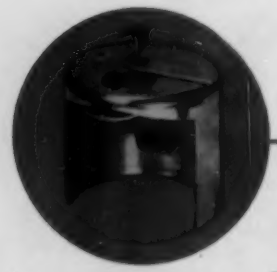
Luminous Ceilings
Industrial areas, too, can benefit from the high intensity, low glare characteristics of luminous ceilings 68

How To Pick Controls
Which should it be, electric or pneumatic controls? The decision becomes more important with the growth of automatic handling 72

Power Factor Correction
An original chart simplifies calculations on cost of capacitors vs power bill savings 76

Power Show Guide_Pg 83

Here's a *Real* STEAM TRAP PACKAGE

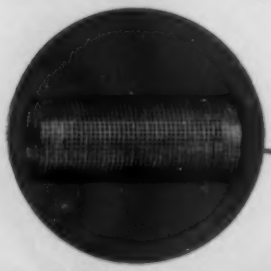


WANT FAST HEAT-UP OF OFF-AND-ON PIPE COILS, HEADERS, UNIT HEATERS, ETC.?

Speed heat-up with Armstrong thermic bucket traps. When steam is first turned on, air is pushed out the large thermic vent—fast! As soon as steam reaches the trap a thermic strip closes the vent, then the bucket functions as a regular bucket. Traps with thermic vent buckets discharge air 50 to 100 times faster than other traps.

NEED A CHECK VALVE AHEAD OF TRAP?

Just specify Armstrong with internal check valve. No check valve installation labor or fittings needed. Spring loaded action and vertical position minimize danger of dirt holding valve open. The Armstrong internal check valve is top quality—long lasting.



NEED A STRAINER AHEAD OF TRAP?

Save money with Armstrong built-in strainer traps. They cost less than a separate trap and strainer and save installation time and money. Stainless steel screen lasts a long time.

Get the full facts about all Armstrong traps. Send today for free Catalog J, The Armstrong Steam Trap Book.

ARMSTRONG MACHINE WORKS
820 Maple Street • Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

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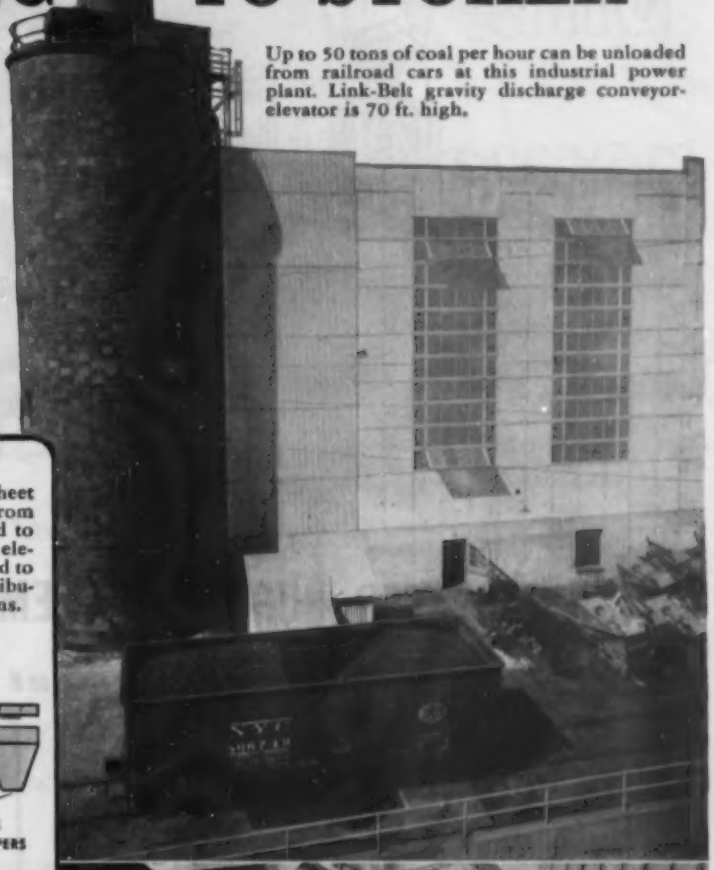
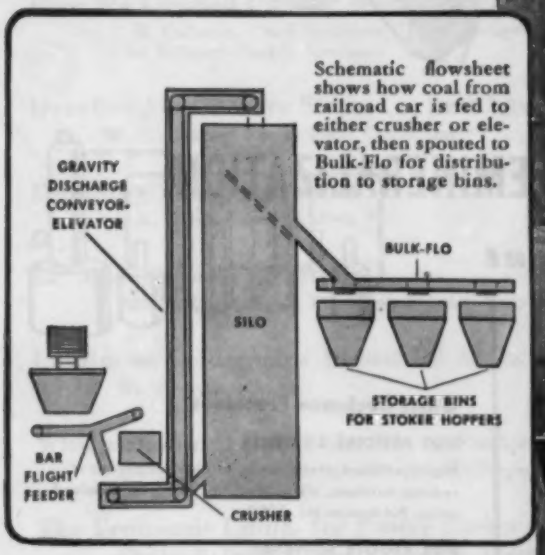
FROM SIDING TO STOKER--

it's Link-Belt for low-cost coal handling



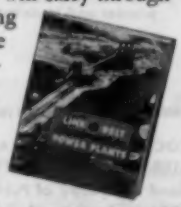
Up to 50 tons of coal per hour can be unloaded from railroad cars at this industrial power plant. Link-Belt gravity discharge conveyor-elevator is 70 ft. high.



Schematic flowsheet shows how coal from railroad car is fed to either crusher or elevator, then spouted to Bulk-Flo for distribution to storage bins.

Simple and effective, this Link-Belt bar flight feeder travels at 45 ft. per min., operates on 45-ft. centers.

WHETHER your coal handling requirements are large or small—Link-Belt can give you a system that assures top efficiency. A complete line of quality equipment is backed by unequalled engineering experience. And Link-Belt will carry through the entire job from planning to erection, if desired. See your Link-Belt representative for all the facts, or write for Book 2410 that shows the latest in modern power plant layouts.



LINK-BELT

COAL HANDLING EQUIPMENT

19.408

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

Dust-tight Link-Belt Bulk-Flo feeder-conveyor delivers coal to any of three stoker storage bins at 15 tons per hour.

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HIGHER WATER PURITY BY DEMINERALIZATION

...A Cochrane Achievement

Long experience with *all* phases of water conditioning problems places Cochrane in the position of leader in the design and application of equipment to meet the exacting requirements of demineralization.

Cochrane Demineralizers now operating on boiler feed and process waters are continuously producing effluents with total dissolved solids and silica residuals approaching zero, within the limits of accuracy of available testing methods. These include 2-bed, 3-bed and 4-bed systems—compact mixed bed units—manually controlled or automatically operated.

Cochrane engineers and manufactures every type of ion exchange precipitation type water conditioning equipment—which assures you of unbiased recommendations for equipment best suited to your requirements. Its complete service provides single responsibility for engineering, fabrication and continued satisfactory operation.

For information on Cochrane Demineralizers, write for Publication No. 5800 and reprints on demineralization.

Other Cochrane Processes

HOT PROCESS SOFTENER

Highly efficient precipitation at high temperatures reduces hardness, silica, alkalinity and total dissolved solids. Publication No. 3000.

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Supplementing the Hot Process Softener, high temperature ion exchange resins completely remove residual hardness with substantial savings in soda ash and phosphate. Publication No. 4801.

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Slurry blanket principle efficiently removes solids, turbidity, color, taste, silica, fluorides; reduces alkalinity and hardness from water for boiler feed industrial process and municipal purposes. Publication No. 5001-A.

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Industry and Power

Published by Industry and Power Publications

Volume 67 — **November 1954** — Number 5

FEATURE ARTICLES

No More Smoke Pollution Headache 51
Chrysler's Winfield Foundry

How We Cleaned Up Our Waste Water 55
J. E. Culleton, Chief Engineer, Spang-Chalfant Division, The National Supply Company

Overfire Air — More Steam . . . Less Smoke 58
W. C. Gaumer, Power Plant Consultant

Humidity Problems Solved 62
J. K. Waits, Joanna Cotton Mill

LP Means Loss Protection 64
Paul E. Peacock, Jr., President, Peacock Corporation

Luminous Ceilings for Industrial Areas 68
W. W. Ayre

Which Should It Be . . . Electric or Pneumatic Controls . 72
S. D. Ross, Industrial Div., Minneapolis-Honeywell Regulator Co.

The Economic Limits for Power Factor Corrections .. 76
Charles N. Debes, Charles N. Debes & Associates, Consulting Engineers

Lower Piping Costs With Lightweight Stainless Piping 81

Guide to Power Show Exhibitors 83

Cover Illustration — Chrysler Corporation
See story page 51

DEPARTMENTS

Acorns	6	Names Make News	108
New Equipment	8	Books & Films	110
Letters From Readers	30	Classified Advertising	116
New Bulletins	36	Available Reprints	116
Ideas in Action	92	Meetings	117
Readers' Guide	99	Advertisers' Index	118

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When ordinary wrenches were used at International Harvester Company, Louisville Works, for holding a tractor transmission cover casting during a milling operation, warpage due to excessive pressure and clamping was charged with 25 to 30 rejects daily. At this stage, each casting costs about $9.45. With the use of PROTO Torquers, rejects due to clamping were eliminated entirely. IH foremen like the PROTO Torquer because it overcomes the problems of dial types, is easy to operate, speeds work and withstands rough usage... Other leading manufacturers, after exhaustive tests, are using the torquer and effecting huge savings. Ask your PROTO dealer for a demonstration of this revolutionary *money-earning* tool. Send 10¢ for 68-page catalog to

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acorns

. . . recently announced . . . worth watching

Sulfurized Bearings

• A promising new process known as sulfurization, or sulfur cementation, of steel, is discussed in a translation from a French journal. It consists in immersing steel or cast iron parts in a bath of particular composition and temperature, making them highly resistant to friction or wear. It has been employed with marked success on hard and soft steels, stainless steel, and steel castings. Alloyed castings and stainless steel respond particularly well to this treatment, and sulfurized steel bearings for rolling cylinder shafts are said to last approximately six times as long as bronze bearings of identical design similarly used.

Atoms for Industry

• The first nuclear reactor for industrial research will be established at the Armour Research Foundation after the AEC approves the design and schedule of operation. The reactor or "atomic pile" will be housed in a new 8000-sq ft building on Illinois Tech's campus in Chicago. It is to be ready in 12 to 16 months.

Greenish Complexion

• Double celled glass blocks for exterior walls and roofs provide soothing daylight glow even in harshest sunlight according to the manufacturer, Pittsburgh Corning Corp. Called "Suntrol," the blocks have pale green fibrous glass diffusing screens sealed into their centers. The company claims that two years of research proved that light coming through the green filter actually makes people feel cooler and more relaxed regardless of temperatures.

Bonding Fiberglass

• The Bureau of Ordnance has announced the development of a new structural material for bonding glass fiber fabrics that will produce laminates and tubular products of superior strength. The new process, on the basis of work accomplished to date, indicates that the following important advantages can be obtained: (1) A glass fiber reinforced structural material that is suitable for higher temperatures; (2) improved strength-weight ratio; (3) high-resistance to usual corrosion agents; (4) raw materials for manufacture available in this country. The new material should find important commercial applications.

"Mighty Mite" Transistor

• Completely transistorized power-line carrier equipment now is being tested by Westinghouse on the Potomac Edison system in Pennsylvania. The equipment is designed for telegraphic functions such as relaying and telemetering. Advantages expected, besides compact design, are long, trouble-free life and elimination of filament-heating power.

Flame-Resistant

• A series of flame-resistant and flame retardant laminates, impact phenolics, and fibrous materials, has been recently introduced. The flame-resistant ingredients of the new series are a component part of the materials and not just a surface treatment. The entire series falls into Class A insulating materials.

Relatively inexpensive, they can be used for many applications that previously required melamine or glass polyesters. The new line is recommended for electrical insulation in such applications as line switchgear equipment, transformer plates, and current carrying parts.

Quality Welds

• A welding electrode to provide better weld quality in inert-gas, shielded arc welding of aluminum has been announced by the Aluminum Company of America. The new electrode can also be used for tungsten-arc welding where filler wire is fed mechanically to the work.

High-Temperature Alloy

• Vacuum-melted, high-temperature special alloys for turbine wheel buckets of jet engines and other such applications—headed by a new alloy capable of withstanding higher temperatures than any wrought alloys now available—are being produced on a commercial basis by Carboloy Dept. of the General Electric Co. It is expected that within a short time, high-temperature resistant alloys of nickel or cobalt-chromium base, hardened with molybdenum, tungsten, carbon, titanium, and aluminum will be produced to withstand temperatures of over 1600 F.

Two Reasons why
CHAPMAN
STEEL VALVES
Keep Maintenance Low in High Pressure Service

Carefully-formulated alloys and *accurately-detailed contours* give Chapman Steel Valves unexcelled dependability under the most severe high pressure and high temperature conditions.

Fourteen alloys are made in Chapman's own foundry, under rigid laboratory supervision, to ensure that every valve is made of the right steel for its specific service.

Precision manufacture to close tolerances is *standard* in Chapman Steel Valves. Designs have been refined to meet the demands of years of smooth operation at minimum maintenance costs. Quality is unsurpassed.

For gates, globes and checks in all pressure classes — 150, 300, 400, 600, 900, 1500 and 2500 psi — and for temperatures to 1150°F, see Chapman first. Valves are supplied with welded, pressure seal or bolted bonnet joints and with flanged or welding ends. Valves equal or exceed ASA standards in every range.

Write for Catalog 20.

THE CHAPMAN VALVE MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS

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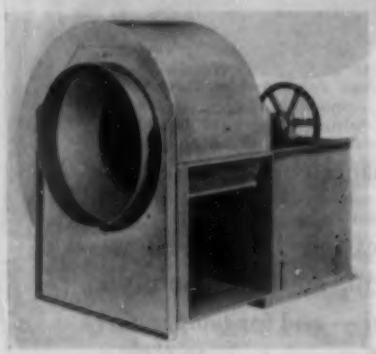
new equipment

. . . new developments

Valve developed for polyvinyl chloride piping

L10 In response to growing interest in polyvinyl chloride piping, Hills-McCanna Co. has added to its Saunders Patent diaphragm valve line models with bodies of polyvinyl chloride. Hand-wheel operated, lever operated, sliding stem, and air operated types are available in sizes from ⅓ through 2 in.



Large volume fans designed for quiet operation

L11 For standard or heavy duty, the Type MD fans introduced by Chicago Blower Corp. are designed for easy installation and quiet performance. They can be supplied with direct or V-belt drive with six different types of acid resistant coatings for any acid or corrosive fume condition. Volumes are from 400 to 3250 cfm and pressures to 1¼ in. wg static pressure for direct drive unit, and 18,000 cfm and 1½ in. for the V-belt drive. Bulletin MD-101 gives detailed information.

Powerful drive unit enclosed in weatherproof housing

L12 The high torque Final Drive unit announced by Republic Flow Meters Co. is for positioning fans and valves in outdoor boilers and for heavy doors and other equipment. Capable of exerting starting torque in excess of 4000 lb ft, it is enclosed in a weatherproof housing, and when furnished with an electric receiver, it can be used with Republic's Telemaster electronic combustion control system. It may be equipped to receive either pneumatic or electric control signals from an automatic source or manually operated control panel.

Unit separates water and air and controls exhaust noise

L13 The long standing need for an instrument that effectively extracts all of the water from water-sealed vacuum pump exhausts, and simultaneously reduces noise of gas discharge to ear-comfort level has been met with the Water Separator Snubber, introduced by Burgess-Manning Co. The combination units range from 6 to 26 in. in dia and handle from 60 to 4700 cu ft per min.

Low cost float trap drains condensate continuously

L14 The need for a low-cost method of draining moisture and condensate continuously from air and gas piping systems is said to be met with the No. 81 float-type moisture trap available from V. D. Anderson Co. The traps are suitable for operating pressures up to 200 psig and have an optional inlet for ease of installation. Connections are ½ or ¾ in. Drawing is available upon request.

Flotation unit removes heavy and light particles

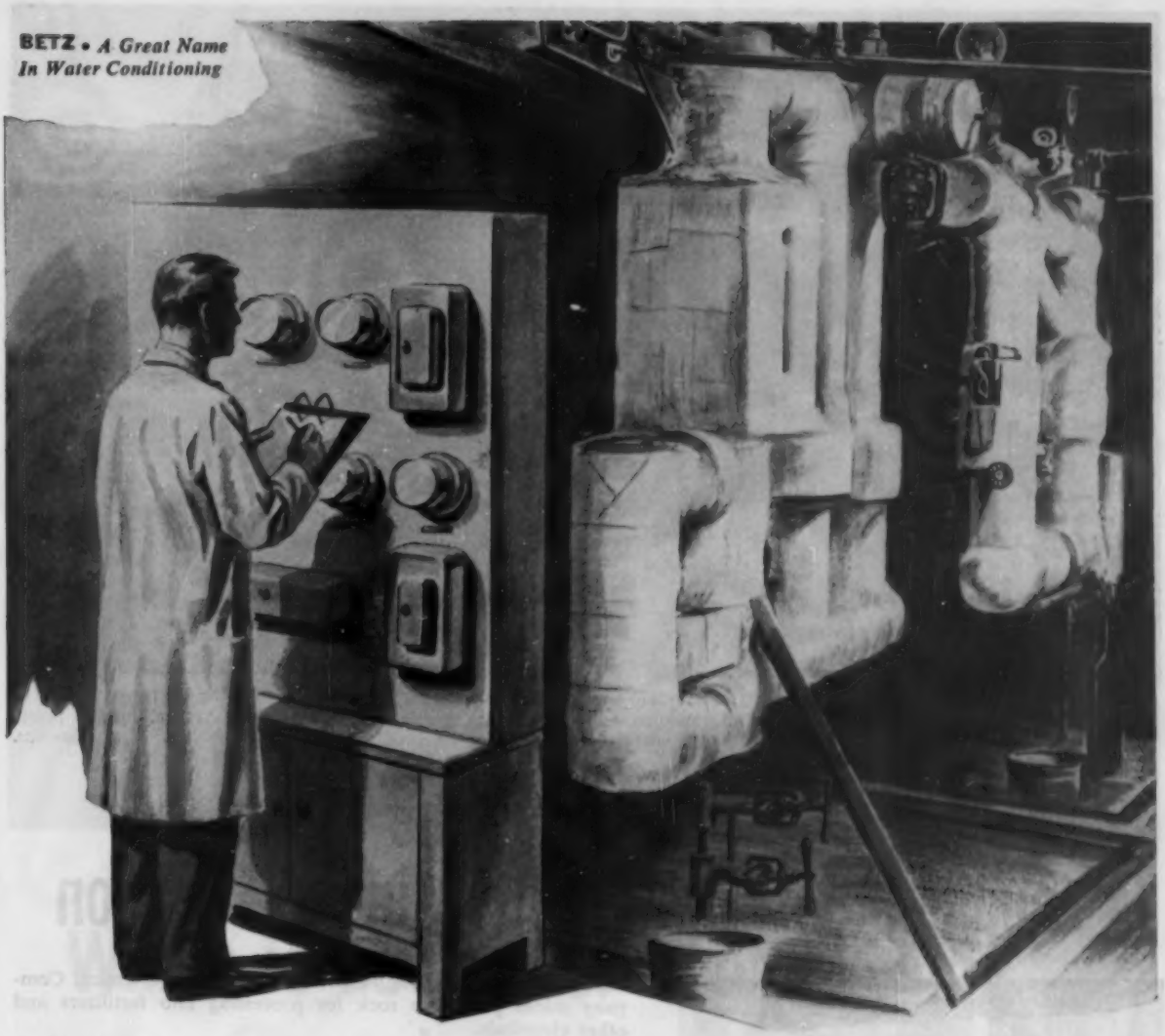
L15 Besides handling floatable particles, Graver Water Conditioning Company's new flotation unit, the Aeroflotor, will also remove settleable particles at the same time in the same unit. Since both types of particles are removed continuously, the unit should be especially advantageous where heavy and light density material are to be removed from the same liquid.

Vapor-tight lighting fixture dissipates heat upward

L16 The pendant type of vapor-tight lighting fixture for industrial use introduced by Pyle-National Co. is designed to dissipate heat

NOTE—Each new product item has a key number for your convenience in asking for additional, detailed information. Circle this number on Reply Card, pages 34/35 & 98/99.

BETZ • *A Great Name In Water Conditioning*



Proving ground for an idea

Many of today's industry-accepted water conditioning techniques were unknown just a few short years ago. Yet they were made possible by the extensive research which is carried on daily at our headquarter laboratories in Philadelphia.

Little wonder then, that we consider our *continuing* program of research and development so important.

The testing and retesting of new chemical compounds and formulations—*under actual plant conditions* in complex "Tom Thumb" equipment like this—is only a small part of our research program conducted to assure better water conditioning for industry.

As a result, advanced Betz discoveries, tested in the laboratory and *job-proved* in the field, have vastly increased operating efficiency and economy in industrial plants, petroleum installations, and institutions—everywhere.

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

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LOW INITIAL COST and widespread reputation for dependability were the big reasons why The American Agricultural Chemical Company selected a Worthington vertical turbine pump. They use it to maintain proper storage level of their water supply lake in dry seasons.

Worthington vertical turbine pump supplements lake water in dry season

PHOSPHATE ROCK IS WASHED DOWN on flat screens to underwater trommels at American Agricultural. The Worthington vertical turbine pump ensures an adequate supply of water during the dry periods when the impounded rain water level in their supply lake gets low.

In Pierce, Florida, The American Agricultural Chemical Company mines phosphate rock for processing into fertilizers and other chemicals.

In washer operations at their South Pierce Mine, American Agricultural uses over 2,500,000 gallons of recirculated water every working day. All the water for this vast operation comes from various mined-out cuts and lakes. During the rainy season, water is impounded in these areas for use in the dry season. In abnormally dry seasons, however, American Agricultural supplements its water storage by using a modern Worthington vertical turbine pump.

Like American Agricultural, more and more industrial plants are turning to Worthington vertical turbine pumps as the most economical means of supplying water. Users everywhere praise the low maintenance and power costs of these dependable pumps.

Write today for our Vertical Turbine Pump Bulletin W-450-B-39. Worthington Corporation, Vertical Turbine Pump Division, Harrison, New Jersey.

4-32

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

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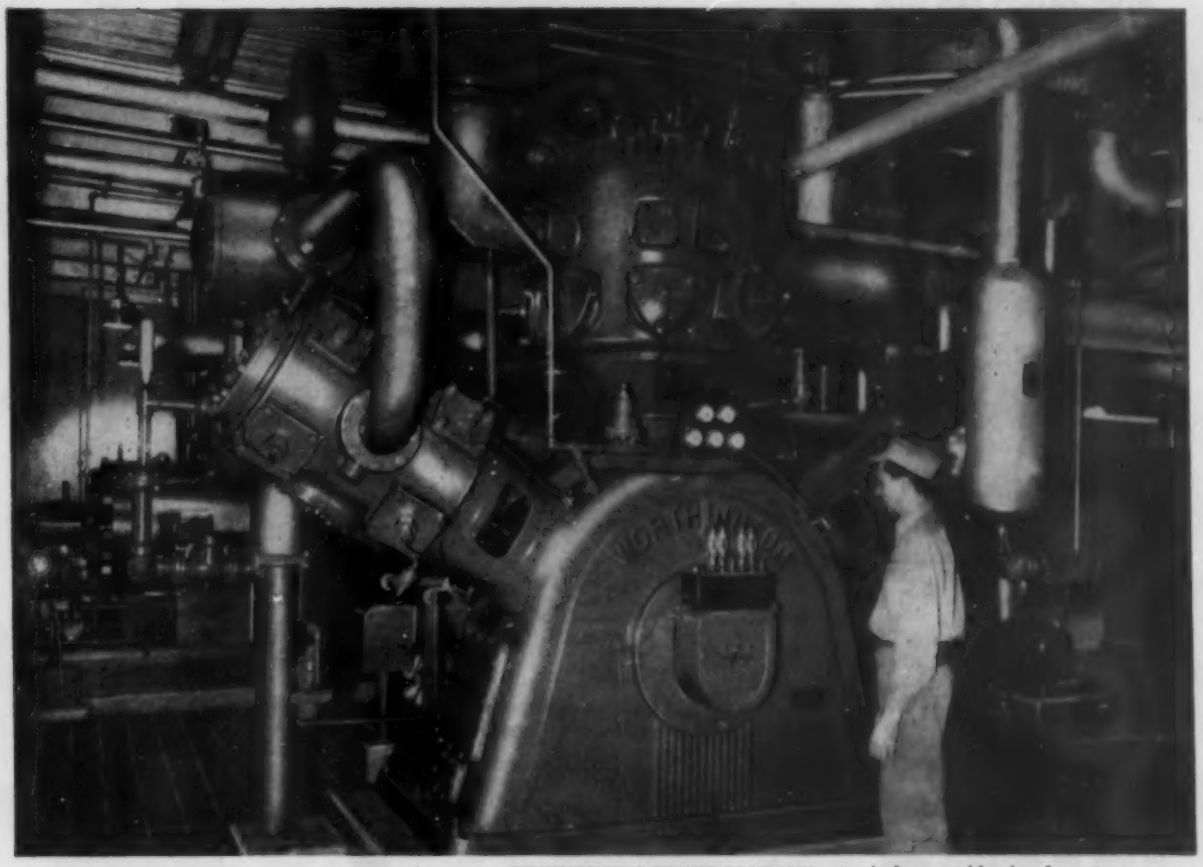


PENNSYLVANIA POWER COMPANY gets air for soot blowing from two Worthington DYC-3 air compressors at their New Castle Power Plant.

Which is better for soot blowing — steam or air?

If we asked that question 20 years ago, the answer would be steam. But today you'd be right if you said "compressed air."

Key to the success of compressed air in soot blowing was the development of simple, automatic controls. Not only can you pre-select an operation sequence for efficient cleaning, but you're sure that the cleaning operation will be complete — and carried on only at the most efficient pressure.

Here are more reasons for using air for soot blowing:

1. Lower-cost, low-pressure, low-temperature piping — with no piping insulation required.
2. Savings on feedwater make-up.
3. Reduced blower maintenance.

For a *dependable* supply of air for soot blowing, more and more power plants — both industrial and municipal — are specifying Worthington compressors. They're equipped with the exclusive Feather* Valve — the lightest, tightest, most efficient valve made. They're designed to give more air — at less cost.

Read our Bulletin L600-B14 — "Worthington Compressors for Soot Blowing". Write for it to Worthington Corporation, Water-Cooled Compressor Division, Harrison, N.J.

* Reg. U.S. Pat. Off. K.4.6

WORTHINGTON

Only Worthington Compressors give you Feather Valve Performance

Y-Types • Balanced Angle • Horizontal • Portable • Radial • Gas Engine Compressors

Circle 507 on Reply Card for more data

new equipment

—Starts on page 8

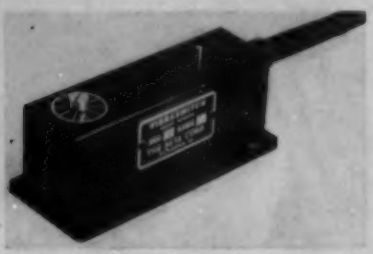
upward thus eliminating the deposit of excessive dirt on the reflecting surface. Known as type BOB, the fixture is available with dome, deep bowl, or 30 degree angle reflector.

Vibrator needs no lubrication

L17 AiroViber Rotary Vibration unit moves bulk materials by breaking up arching and jamming in bins, hoppers, chutes, feeders, and other places where bulk materials hang up. It is recommended for loading, unloading, grating, or separating materials. The unit has only one moving part—a steel ball which is blown at high speed around the steel track in the housing by means of an air jet. It performs at high or low temperatures and needs no lubrication. Viber Co.

Starter prolongs life of fluorescent lamps

L19 Longer average life for regular 40-w fluorescent lamps is said to be possible with the new starter, FS-400 Watch Dog, announced by General Electric Company's Construction Materials Div. In effect, the glow switch starter assures proper pre-heating time for lead-circuit lamps and thus prolongs lamp life.



Monitoring switch protects machinery against vibration

L20 For protection of electrical generating equipment, compressors, and other expensive rotating machinery against damage from excessive vibration, the Beta Corp. is introducing the Model 1 Vibraswitch. Low cost and simplicity of installation are said to make it equally applicable to old or new equipment. It requires no special power source or auxiliary apparatus and can be used to actuate a warning device or to shut off the machine.

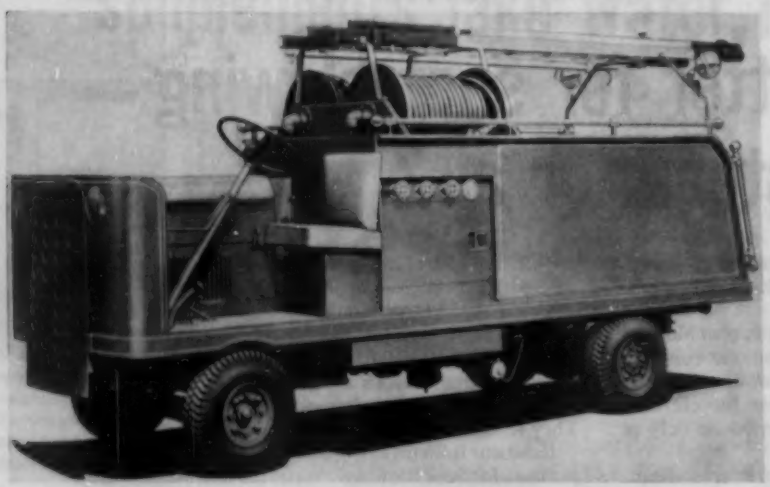
Economical lifting power furnished by hydraulic unit

L21 In any operation where economical power is desired to replace slow and tedious hand lift, the PumPac electric power hydraulic unit is said to meet the requirements.

TO GET MORE INFORMATION

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

The unit consists of a pump, oil reservoir, and valve which, when connected to any 6 v or 12 v battery, develops a variable range of pump pressure from 2000 to 5000 psi. Designed by Jarp Corp., the pump housing accommodates a relief valve assembly where required and the motor can be removed from the pump for easy repair to either unit by simply removing two bolts.



Industrial fire truck maneuvers in plant aisles

L18 Designed into this industrial fire truck is all the fire fighting punch of a full-size municipal type fire truck with the added advantage of small size and maneuverability engineered for negotiating factory aisles with ease.

The truck's 300 gal tank holds enough water for a full 20 min of normal fire fighting and the truck also is equipped to pump water from plant water lines or from a straight draft source such as a pond or cistern. High pressure fog is discharged at the rate of 20 gpm at 600 psi nozzle pressure. Two fog lines, operating from spring loaded reels, are equipped with trigger controlled John Bean high pressure fog guns. Each gun is easily handled by one man.

Four ft wide, 140 in. long, and 79 in. high, it has a wheelbase of 76 in. and a turning radius of less than 15 ft. The truck can go 25 mph, has four forward speeds and reverse and can climb a 16 percent grade. John Bean Div., Food Machinery & Chemical Corp.

Fixture mounts where bottom feed is necessary

L22 Mounting on walls, above upper rails of walks, vertical outdoor stairways, or catwalks is possible with this 200-w pedestal lighting fixture, type VPH 4209, introduced by Crouse-Hinds Co. The fixture is completely vapor tight with a large porcelain enameled steel reflector which directs light downward. The 1¼ in. hub

Prevent heat loss up the stack. Too much or too little excess air means big money in today's boiler plant. It's important to *know* and *control* excess air exactly—regardless of load or fuel changes.

Burn multiple fuels efficiently

When switching from one fuel to another or burning more than one fuel at the same time, only an Oxygen Recorder gives you an undistorted picture of excess air. It measures O_2 directly and continuously, without recalibration.

Hundreds of companies are reaping large savings with Hays Electronic type Oxygen Recorders in their boiler plants. Flue gas sampling systems fit a wide variety of installations.

With the Hays Electronic type Oxygen Recorder you get continuous, highly accurate indication and recording . . . complete compensation for temperature and pressure effects . . . freedom from chemicals or hazardous fuel burning in the analyzing process . . . swift, sure electronic operation.

Write today for Hays Bulletin 52-829-56. Also ask for a dramatic comparison graph which shows that the relationship between O_2 and excess air is practically constant for different fuels.

Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Variflow Meters and Vertrol
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Electronic Feed Water Controls
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MICHIGAN CITY 2, INDIANA

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Shown observing combustion conditions in one of Maywood Chemical's new B&W Integral-Furnace Boilers, Type FJ, Frank Green, Chief Engineer, reports complete satisfaction with their performance . . . verifies fuel savings up to 25%.

Cross-sectional view of typical stoker-fired B&W Integral-Furnace Boiler, Type FJ. Suitable for coal, gas, and oil firing, it is available in a steam capacity range from 30,000 to 70,000 lb per hr at pressures to 800 psi. For a detailed description of design and operating features, write for Bulletin G-70. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

2 B&W Integral-Furnace Boilers CUT COSTS $300 PER OPERATING DAY

at MAYWOOD CHEMICAL WORKS

To assure a constant and reliable steam supply under conditions where demand varies between 35,000 and 100,000 lb per hr, Maywood Chemical Works recently placed in service two stoker-fired B&W Integral-Furnace Boilers, Type FJ. These units replaced eight old boilers that were not producing steam efficiently or in sufficient quantity to meet plant requirements. Each new boiler has a design capacity of 55,000 lb per hr at 150 psi, and is designed to burn oil from a side wall, without disturbing the stokers now in use for coal firing. As a direct result of the change-over, steam capacity is up, while fuel, operating labor, and maintenance costs are reduced by substantial amounts . . . fuel savings alone are estimated at between 20 and 25%.

Concerning performance of the new B&W Units, Mr. Frank Green, Chief Engineer of Maywood Chemical is enthusiastic. "Boiler response is excellent . . . as high as 50,000 lb per hour in a minute for the two units. Cheaper grade of fuel is burned efficiently and steam pressure is steady and continuous. Although boilers are equipped with soot blowers they are not needed and are not used. Our previously serious fly-ash problem has been substantially reduced."

After installation plans were made by Maywood's consulting engineers, A. Wilson and Co., B&W took over the complete boiler erection job. B&W service engineers then started up the boilers for a thorough operational check before turning them over to Maywood Chemical as complete, efficient, in-service units.

COST SAVING FEATURES

of B & W Integral-Furnace Boilers for Steam Requirements from 2,800 to 350,000 Lb. Per Hr.

- Minimum floor space and headroom requirements
- High fuel economy
- Smokeless combustion
- Adaptable to all fuels and firing methods
- Economical fast steaming
- Water-cooled furnace
- Clean, dry steam at all ratings, even with high boiler water concentration
- Quick response to wide and heavy load swing demands
- Easy to inspect and clean
- High availability with least attention

BABCOCK & WILCOX

G-599

Circle 509 on Reply Card for more data

new equipment

—Starts on page 8

allows use of ordinary conduit as a vertical support. The hinged assembly facilitates easy relamping.

No heat required to splice cable in the field

L23 Factory-perfect cable splices under field conditions are said to be made quickly and easily using a new splicing and insulating method introduced by Minnesota Mining and Manufacturing Co. The method involves embedding the splice in liquid epoxy resin which hardens into a hermetically sealed casting. No heat is required. All materials necessary are furnished in kit form. Each kit makes one complete splice in single conductor cable with wire sizes from 10 to 4 AWG. No tools are required other than a pocket knife.

Reducers mount on floor, wall, or ceiling

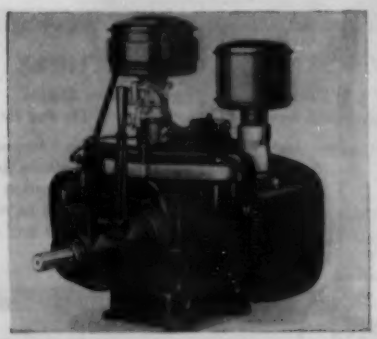
L24 Each type of Multi-Mount Reducer can be mounted, without modification, on floor, wall, or ceiling, with shaft horizontal or vertical, according to the manufacturer Sterling Electric Motors, Inc. Double and triple reduction Multi-Mount Reducers are available in a variety of mounting types —with feet or footless, face or flange mounted, and in a wide range of horsepower ratings and speeds.

Motor control centers fit into small space

L25 Up to 50 percent in floor space can be saved by use of General Electric Company's new line of motor control centers designed to take nine NEMA size one starter units or six NEMA size two units in the standard 90 in. trough without reduction in pull-box space. To be known as DA-7093, the control centers are designed with a new center busing arrangement that frees pull-box space for wiring and increases vertical bus capacity from 300 to 600 amp. Distribution Assemblies Dept., of General Electric Co.

TO GET MORE INFORMATION

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.



Hand clutch engages at all engine speeds

L26 Designed to engage at all engine speeds, the wet type, level operated hand clutch, a new development for the 26.8 hp K660 air-cooled engine, is mounted on anti-friction ball bearings. The two-cylinder engine now known as the K660C also features an air cooling system which keeps the four-cycle heavy duty engine at correct temperatures under all operating conditions. Kohler Co.

Valve applies sealant under line pressure

L27 Self-sealing 2-way conduit valve, introduced by Darling Valve & Manufacturing Co. in sizes of eight inches and larger, offers a dependable answer to problems of pipeline service. Two reservoirs within the valve contain enough sealant for about 50 operations. When valve is closed, line pressure forces sealant into a channel on downstream face of seat. Only servicing required is periodic recharging of cylinders with sealant.

System provides faster cooling, better lubrication

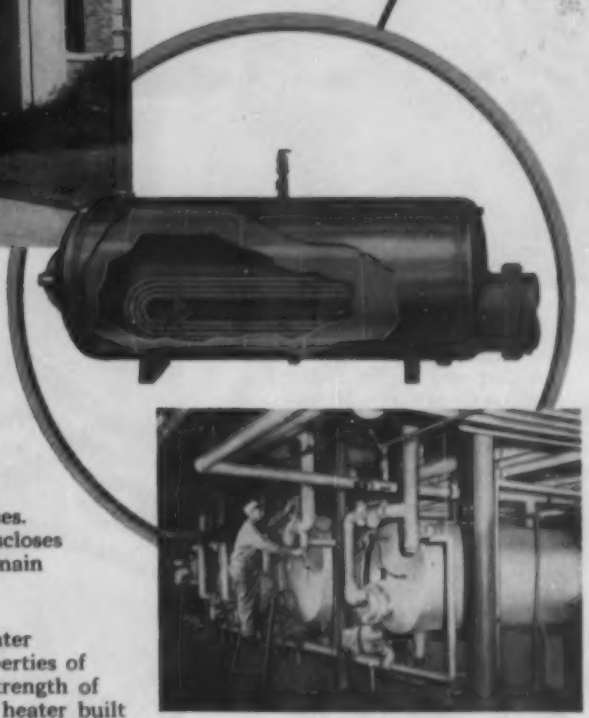
L28 The Spray-Lube System of applying cutting liquids has, in field tests, doubled the speed of roughing and finishing the inside surface of cast aluminum tire molds according to the C. A. Norgren Co. On metal machining operations the system is said to insure longer tool life, less machine downtime, lower tool maintenance costs, elimination of coolant reprocessing and chip spinning, and substantial savings in consumption.

Bucket steam trap solves problem of varying loads

L29 Especially suited to process industries where load and pressure range vary, the Uni-Trap bucket steam trap employs a balanced valve principle, automatically operating through complete pressure ranges up to 250 psi without adjustments, orifice changes, or valves. Introduced by Perfecting Service Co., all internal parts of the trap are made of stainless steel. Traps are available in pipe sizes ½ through 2 in. Catalog 800 gives more detailed information.

for Rust-Free Hot Water

look for the
Copper Lining
they did at this
SEALTEST PLANT



Pure, rust-free hot water is a *must* for dairy operations. For that reason, the men responsible for specifying hot water heaters for Supplee-Wills-Jones Milk Company in Philadelphia decided many years ago on **p-k** copper-lined hot water storage heaters as the best bet against corrosiveness in water.

For this plant, five **p-k** hot water heaters have been used for processing, cleaning, sterilizing and for general utility purposes. Recent examination of these heaters discloses no sign of corrosion. Copper linings remain bright and unpitted. Maintenance? Just routine.

A **p-k** Copper-Lined storage heater combines the non-corrosive properties of copper with the outstanding strength of steel . . . a complete, copper heater built inside of and reinforced by a heavy steel shell.

For an unfailing source of pure, rust-free hot water,

LOOK FOR THE **p-k** Copper Lining

Comprehensive catalog gives you all the facts. It's yours for the asking.

the **Patterson-Kelley Co.,** inc.

1210 Burson Street, East Stroudsburg, Penn.

8022

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities.

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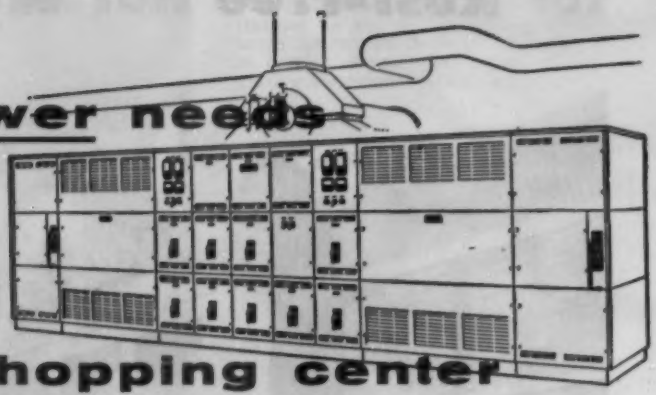
Servicing the Power needs of the world's largest shopping center



Northland—gigantic, ultra-modern shopping center of the J. L. Hudson Company—offers suburban Detroit the utmost in shopping convenience. The Hudson Building, hub of the Center, is surrounded by five tenant structures, housing approximately 80 different stores.

An extensive electrical system, capable of supplying electricity for some 25,000 homes, brings Northland to life. From primary power to ultimate use, this system represents an outstanding example of commercial planning and foresight. I-T-E Unit Substations—channeling power throughout this shopping empire—are strategically located to provide maximum protection, control, and continuity of service.

Only the finest has been installed at Northland. Electrical distribution equipment—of fundamental importance—must be rugged and dependable to service such demanding power needs.

at Detroit's

NORTHLAND PROJECT

vital energy for a shopping wonderland
supplied by I-T-E dry-type, double-ended Unit Substations

Eleven I-T-E metal-enclosed Unit Substations, rated 1500 and 2000 kva, service the Center's immense lighting and power requirements. And to assure service continuity, Northland's electrical system features I-T-E Selective Tripping devices on the circuit breakers, which *isolate* system faults by interrupting only the circuit nearest the fault.

From the start, important engineering aid was given Northland by I-T-E application engineers. Thanks to this close cooperation, power distribution equipment was on hand *when needed* to fit right in with tight construction schedules.

I-T-E is proud of its place as a *major* contributor of quality power distribution equipment for the "world's largest shopping center."

AT NORTHLAND—

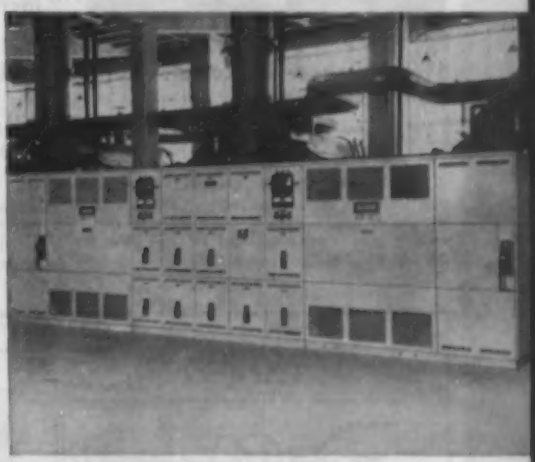
I-T-E Substations service:

interior lighting	**escalators**
exterior lighting	**pumps & blowers**
display lighting	**air conditioning**
elevators	**compressors**
conveyors	**refrigeration**

For details contact the I-T-E field office nearest you. Look in your classified directory under "Electric Equipment."

I-T-E UNIT SUBSTATIONS
service all interior lighting needs of the Center.

I-T-E UNIT SUBSTATIONS
installed in basement of Hudson Building for 4800—120/208 volt lighting distribution.



I-T-E UNIT SUBSTATION
installed in Utility House for 4800—480 volt power distribution.

THE SYMBOL OF QUALITY SWITCHGEAR

I-T-E CIRCUIT BREAKER COMPANY

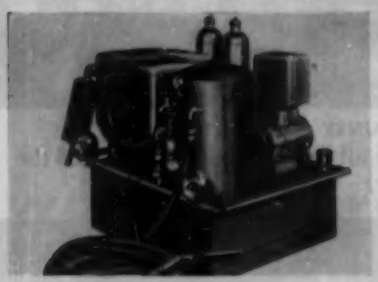
19TH AND HAMILTON STREETS, PHILADELPHIA 30, PA.

UNIT SUBSTATIONS

Circle 511 on Reply Card for more data

new equipment

—Starts on page 8



Fire-fighting equipment also provides emergency power

L30 A "one-man" fire department, Versatile Power multi-purpose unit, utilizes a chemical solution called Unox which is said to multiply the effectiveness of water from 10 to 20 times. The unit which is powered by a 3500 w a-c Onan electric generating plant, also serves as a source of portable or emergency power. National Alarms Corp. has designed the unit for mobility—it fits easily into the back of a standard Jeep.

Steam cleaner effective for toughest jobs

L31 The toughest dirt in railroad box cars, chemical processing plants, and areas contaminated by flood waters can be cleaned with the portable Vapor-Clarkson Corp. Hydro/Steam Cleaner Model 4989-G which jets out 1200 gal of hot water an hr at 240 lbs pressure. The 40 hp generator develops 120 lbs working steam pressure in two minutes from cold water and over 1100 lbs of steam per hr. High pressure steam hoses and a cleaning gun are included.

Lightweight plastic pipe has many applications

L32 If you have been meaning to investigate the use of flexible plastic pipe for cold water systems, sewage and waste, or for conveying industrial chemicals and gases, you will want more information on a new light weight plastic pipe, known as Series 200, developed by Quaker Rubber Corp., Div. of H. K. Porter Co., Inc. It will not rot, rust, or corrode, is easily handled, is non-toxic, and requires no special tools to install.

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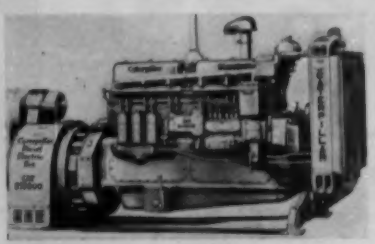


Redesigned engines feature increased output

L33 New changes in design of its D13000 Diesel Engine resulting in increased outputs are announced by the Engine Div. of Caterpillar Tractor Co. The marine engine is increased from 1000 to 1225 rpm and from 120 to 150 hp. The diesel electric set now operates at 1200 rpm and has been increased in capacity from 80 to 100 kw. Larger, stronger valves, a metal-enclosed vibration damper, a new oil-bath air cleaner, and larger water pump are featured.

Conveyor-stoker unit operates without manual attention

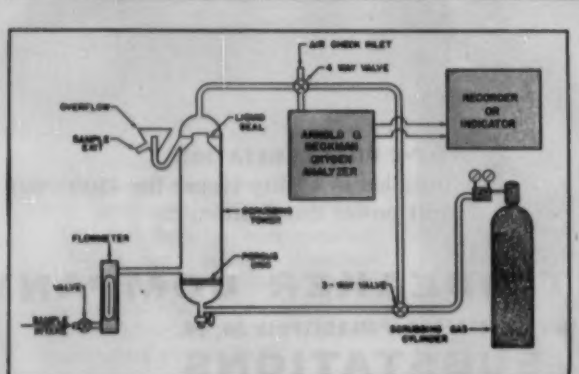
L35 To convey coal directly from coal storage to furnace without manual attention, Canton Stoker Corp. is offering the Bin-Fed Ramfeed Stoker as a package unit. It incorporates the Flo-Tube Conveyor with the Ramfeed Stoker of either the Vulcan or LoSet Types. Combinations of horizontal and inclined conveyors can also be supplied where two or more hoppers are to be supplied with fuel.

Mobile power shovel works in narrow aisles

L36 Especially suitable for working in narrow aisles and tight corners as in box car unloading, the Bulk Master mobile power shovel has a capacity of 11 cu ft or 1200 lbs. Full-shovel lifting speed of six sec., dumping speed of one sec., and lowering speed of three sec., with a dumping angle of 60 deg are features of the machine. Bucket can be carried without spillage in completely lowered position. Clark Equipment Co.

Acid-resisting packing provides tight seal

L37 For use against sulphuric, nitric, and other acids in various concentrations where a tight seal in flanges is necessary, and for temperatures up to 400 F, Raybestos-Manhattan, Inc. announces a new compressed asbestos sheet packing. Gaskets made from this material, known as R/M No. 1307 are less fragile and brittle then those made from sheets of blue as-

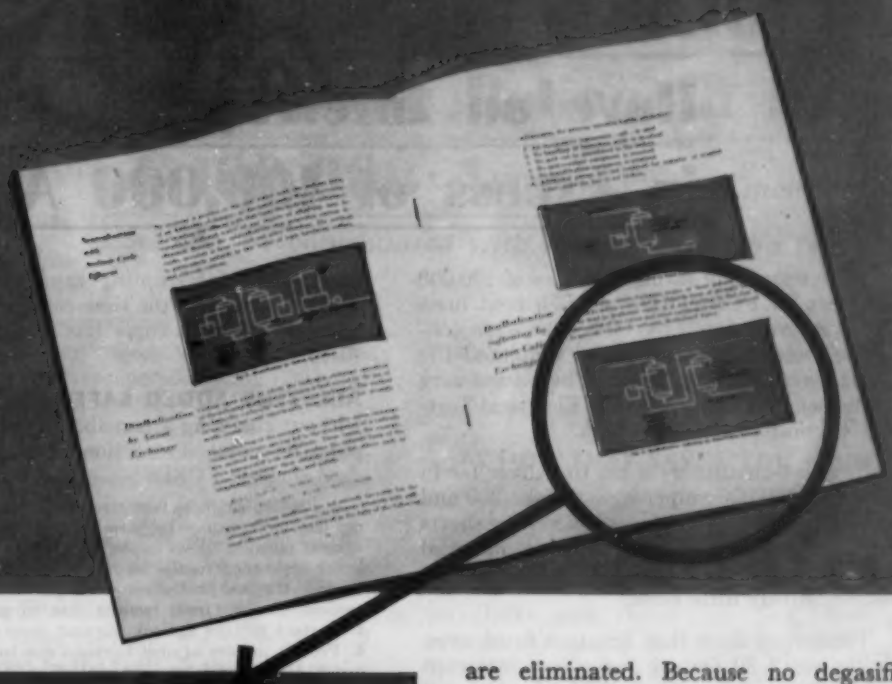


Instrument provides continuous measurement of dissolved oxygen

L34 Continuous measurement of dissolved oxygen in waste, sewage, and water treatment, and in manufacturing processes is offered by the Model 1A3B Dissolved Oxygen Analyzer made by Arnold O. Beckman, Inc. It is designed to read percent saturation directly but scales are available calibrated in parts per million. It may be used with any standard potentiometer recorder or indicator thus simplifying its installation where certain types of recorders are preferred.

The model combines in one unit a simple physical scrubbing mechanism for removing dissolved gases from the liquid being analyzed and a standard oxygen analyzer for measuring the oxygen in the removed gases. This combination is said to provide a highly accurate measuring system for dissolved oxygen.

AMBERLITE ION EXCHANGE RESIN REDUCES ALKALINITY WITHOUT ACIDS OR DEGASIFIERS



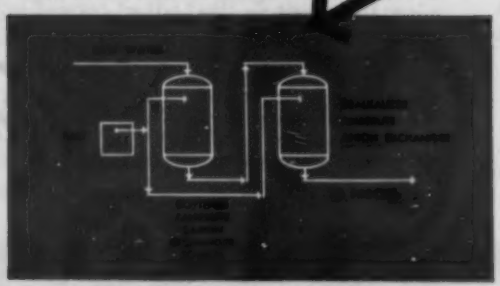


Fig. 6—Dealkalization-Softening by Anion-Cation Exchange

A strongly basic AMBERLITE anion exchange resin permits control of alkalinity of water supplies for boilers and cooling systems conveniently and at low cost. Only common salt is required as regenerant for the resin. No acids are used, hence expensive acid-resistant equipment and associated handling problems are eliminated. Because no degasifier is required, line pressure is not broken, and pumping costs are reduced.

New Book Gives Valuable Information on Water Treatment Problems

Rohm & Haas Company's new book, *If You Use Water*, discusses this up-to-date technique —and many other ion exchange methods of water treatment as well. Softening, combination softening-dealkalization, silica removal, deionization, are just some of the topics considered. Your request for this book will bring you a copy promptly, will show you why in ion exchange the resin that's *right* is AMBERLITE.

Send for your free copy of this book today

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE REGINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

Representatives in principal foreign countries

AMBERLITE is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.

Circle 512 on Reply Card for more data

ROHM & HAAS COMPANY

Washington Square, Philadelphia 5, Pa.

Please send me a copy of "If You Use Water..."

Name_____

Title_____

Address_____

City_____ Zone____ State_____

Proven On loads *UNDER* 600 Amps....

Fusetron dual-element Fuses Have an Interrupting Rating in Excess of 100,000 Amps.

An interrupting rating in excess of 100,000 amperes for FUSETRON dual-element fuses . . . this was shown by tests that were conducted under conditions that simulated the most severe field conditions. These tests were witnessed and verified by the Electrical Testing Laboratories of New York.

The test circuits were set to deliver far in excess of 100,000 amperes — yet the 250 and 600 volt FUSETRON fuses cleared the shorts without igniting readily flamable material placed around the fuses . . . and there was comparatively little noise.

These tests show that Fusetron fuses, even in the small 30 ampere range, can interrupt safely the most severe available short circuit current.

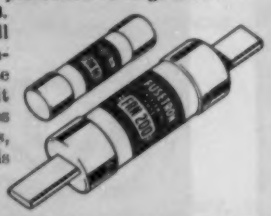
No interference with time-lag

Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses. Even though the interrupting capacity has been greatly increased, the time-current characteristic of Fusetron fuses has in no way been disturbed.

ALL THIS ADDED SAFETY

without changing a panelboard or switch . . . plus 10 point Protection of FUSETRON dual-element FUSES!

1. Protect against short-circuits. **2.** Protect against needless blows caused by harmless overloads. **3.** Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation. **4.** Provide thermal protection — for panels and switches against damage from heating due to poor contact. **5.** Protect motors against burnout from overloading. **6.** Protect motors against burnout due to single phasing. **7.** Give double burnout protection to large motors — without extra cost. **8.** Make protection of small motors simple and inexpensive. **9.** Protect against waste of space and money — permit use of proper size switches and panels. **10.** Protect coils, transformers and solenoids against burnout.



Fusetron Fuses Help eliminate needless Shutdowns for Production Engineers.

Work stoppages caused by needless blows are prevented. Even if all the motors on a circuit start at one time or other harmless overloads occur, the fuse link holds to prevent a shutdown.

Likewise, Fusetron fuses guard against needless blows caused by excessive-heating in panelboards and switches—lesser resistance results in cooler operation.

Fusetron Fuses Offer Maximum Safety for Electrical and Safety Engineers.

With an interrupting rating of 100,000 amperes, Fusetron fuses give the greatest possible protection against damage due to short-circuits. And just as important, they reduce the hazard of motor burnouts due to single phasing and overloading.

Fusetron Fuses Save Time and Work for Maintenance Engineers.

Once properly installed, Fusetron fuses require no costly inspection time or down-time for calibration and other maintenance necessary on mechanically operated devices.

Unnecessary repair work on motors is avoided because Fusetron fuses reduce to a minimum the danger of damage due to electrical faults. If trouble occurs, instead of rewinding or replacing burned out motors, simply replace Fusetron fuses.

Switches and panelboards are protected against damage from poor contact heating.

Fusetron fuses also protect against needless blows that cause irritating interruptions of regular maintenance.

Proven On loads *ABOVE* 600 and up to 5,000 Amps.

BUSS Hi-Cap Fuses Have an Interrupting Rating In Excess of 100,000 Amps. . . *and their blowing time can be coordinated with that of Fusetron fuses.*

An unlimited interrupting rating for BUSS Hi-Cap fuses on any voltage up to 600 . . . this was confirmed by tests reported by the Electrical Testing Laboratories of New York.

BUSS Hi-Cap fuses are designed to give protection against dangerous overloads as well as high fault currents — yet retain the speed of operation necessary to limit heavy short currents to safe values.

When coordinated properly with Fusetron dual-element fuses they will not open ahead of the fuse nearest to the fault — thus the trouble is isolated to the part of the circuit in which the fault occurs.

Added SAFETY on Old Installations

On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of bad fault.

ACTION THAT SAVES YOU MONEY

Don't risk losses. Delay may cost you far more than replacing every fuse with a FUSETRON fuse. By passing the word along that all purchase and stock records should call for FUSETRON dual-element fuses on loads up to 600 amperes — and BUSS Hi-Cap fuses on loads above that, you get action that begets money saving.

On New Construction tell your architect to specify this Safer, Better Protection.

Fusetron Fuses Cuts Cost for Top Management.

Cuts maintenance cost — Fusetron fuses are maintenance free.

Cuts motor repair cost — Fusetron fuses guard the motor, against damage due to overloading, single phasing, short circuits and other electrical faults.

Cuts production costs — Shutdowns due to needless blows are eliminated.

Cuts new installation costs — Smaller sizes can be used, therefore big savings can be made on switches and panelboards.

Cuts present installation costs — Fusetron fuses hold and won't open on starting currents so the need for larger panelboards and switches is often eliminated — and in many cases new motors can be added to the circuit without installing larger panelboards or switches.

Play Safe—Install Fusetron Fuses and BUSS Hi-Cap Fuses now!

For blowing time charts or more information on FUSETRON fuses and BUSS Hi-Cap fuses use coupon or write for bulletin FIS and HCS.

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

BUSSMANN Mfg. Co.
(Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.
Please send me complete facts about FUSETRON dual-element Fuses and BUSS Hi-Cap Fuses.

Name _____
Title _____
Company _____
Address _____
City & Zone _____ *State* _____ 954

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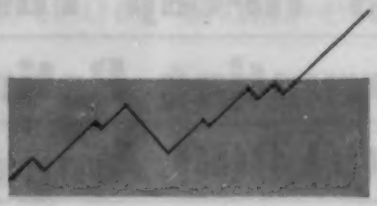
TO KEEP COSTS DOWN

KEEP PRODUCTION UP



WITH MANZEL FORCE FEED LUBRICATION

Pressure Application — Exact Amounts — Accurately Timed

Manzel Force Feed Lubricators insure efficient machinery operation by lubricating automatically. No stops for hand oiling — or because of breakdowns caused by faulty lubrication. They

quickly pay for themselves through savings in down time, labor and lubricants.

These sturdy, dependable lubricators can be installed on new or existing equipment. Write for details.

Manzel

DIVISION OF FRONTIER INDUSTRIES, Inc.
320 BABCOCK STREET, BUFFALO 10, NEW YORK

Circle 514 on Reply Card for more data

new equipment

—Starts on page 8

bestos fibres. They have higher tensile strength and better flexibility. Packing Div., Raybestos-Manhattan.

Taping gun speeds up electrical harness wrapping

L38 Electrical harness wrapping can be speeded up from 2 to 10 times using plastic tape dispensed by the Scotch taping gun, model E-2. It is designed for ¾ in. Scotch brand plastic electrical tape No. 33, according to the manufacturer, Minnesota Mining and Manufacturing Co. The gun weighs less than 20 oz with a 36-yd roll of tape in the circular magazine.

Re-rated one to five hp motors now available in quantity

L39 Re-rated Tri-Clad "55" polyphase induction motors are now available in any quantity in ratings from one to five hp from General Electric Company's Small Integral Motor Dept. in frames 182, 184, 213, and 215. All ratings are available in totally-enclosed models as well as the regular dripproof enclosure. Both types are also available in sample quantities in 7½ and 10 hp ratings, NEMA frames 254U and 256U.

Problem of water logged expansion tanks solved

L40 Bell & Gossett announces a low cost valve in ⅜ in. size with a standard ¾ in. hose connection for a drain. Valve design is said to

How to Select an Economical Temperature Regulator

First of all, what does economy mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

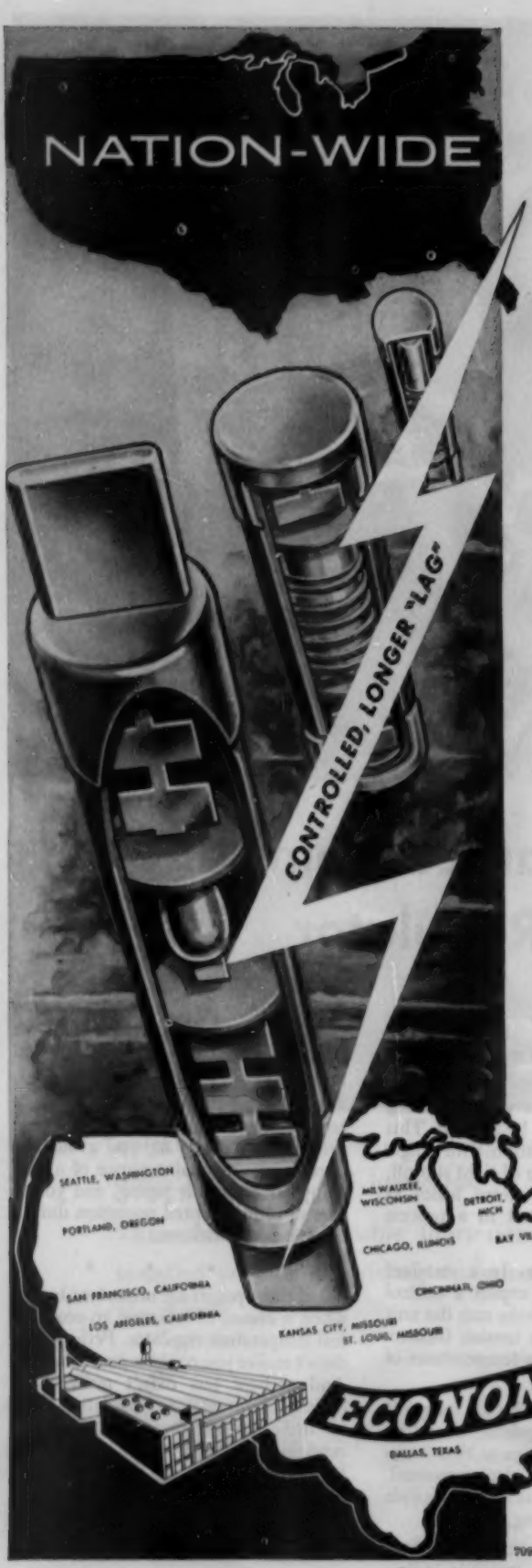
Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you could expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T500 containing further details? SE 100

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

Circle 515 on Reply Card for more data



PROTECTION

Against Overloads & "Shorts"

ECON®

DUAL-ELEMENT cartridge fuses

From Massachusetts on the Atlantic to Washington on the Pacific, and from Canada to the Gulf Coast, industry is now enjoying the advantages of more dependable protection for electrical equipment and circuits . . . thanks to ECON Dual-Element Cartridge Fuses.

Eighteen strategically located district offices assure electrical wholesalers and fuse users of Economy's readiness to solve circuit protection problems.

ECON Dual-Element Fuses, in addition to providing dependable motor and branch line protection, also act as an effective guard against high temperatures and their resulting hazards. Available in knife and ferrule types, 0 to 600 amperes, 250 and 600 volts. Underwriters' Laboratories, Inc. approved. Carried in stock by leading Electrical Wholesalers. Write for New Econ Catalog S-60 or for literature on other type fuses in which you are interested.

Your Electrical Wholesaler has ECON Dual-Element Cartridge Fuses in stock.

ECONOMY fuses for every purpose

ECONOMY FUSE & MANUFACTURING CO.

709 2717 GREENVIEW AVE. • CHICAGO 14, ILLINOIS

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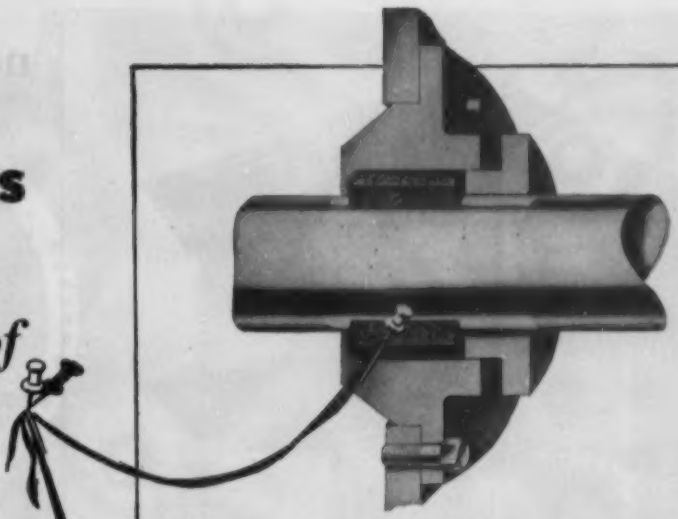
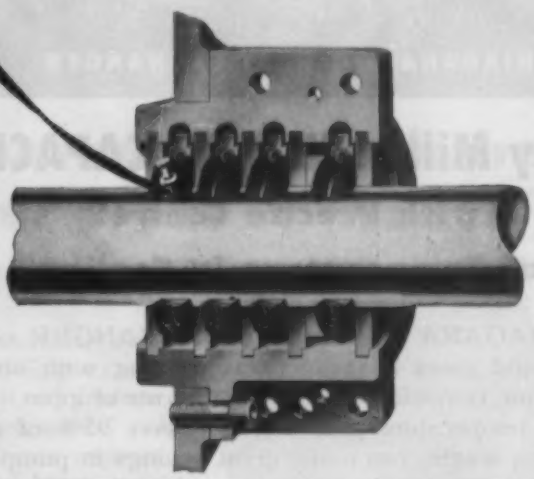
COPPUS TURBINES

offer you a choice of packing rings



STANDARD METALLIC RING PACKING — Made of high grade asbestos cores encased in specially treated lubricated aluminum foil. Recommended as a low-friction, long-service packing for steam temperatures up to 850 F and back pressures up to 50 lb. Adjustable packing glands keep leakage at minimum. Easy access to packing rings.



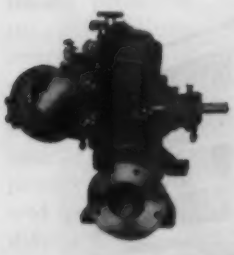
OPTIONAL CARBON RING PACKING — Consists of three carbon packing rings on the pressure side and one beyond the leak-off section. Each ring has three segments held together by a stainless steel garter spring. For back pressures up to 75 lb. Standard for vacuum or gas operation, or when leak-off is desired.

Heavy chrome plating on shaft at stuffing box is common to both types of Coppus packing.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

FIT TURBINE COSTS TO HORSEPOWER NEEDS

When you buy turbines rated close to your exact horsepower needs, you save plenty of money. That's because turbines are generally priced in proportion to their size. The wide range of sizes of Coppus Turbines promises purchasing economy for you from the 150 hp size down to the smallest. As for operating and maintenance economies, you get them, too, from such other features as: greater number of manually operated valves for individual control of steam nozzles; replaceable cartridge-type bearing housings and others. For complete details . . .



WRITE FOR BULLETIN 135
COPPUS ENGINEERING CORPORATION
191 Park Avenue
Worcester 2, Mass.
Sales offices in THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

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Thirty Million B.T.U. CAPACITY

with Precise Control of Temperature in Cooling

The NIAGARA Aero HEAT EXCHANGER cools liquids and gases by evaporative cooling with atmospheric air, removing the heat at the rate of input, controlling temperature precisely. You save 95% of cost of cooling water; you make great savings in pumping, piping, power; quickly recover your installation cost.

You can cool and hold accurately the temperature of all fluids, air and gases, water, oils, solutions, chemical intermediates, coolants for mechanical, electrical and thermal processes. You obtain closed system cooling free from dirt. You solve all the problems of water availability, quality or temperature.

In CHEMICAL PROCESSES this is successfully used in cooling liquids and gases, chemical reactions, condensing distillations and reflux cooling.

Write for complete information; ask for Bulletins 120 and 124. Address Dept. IP

NIAGARA BLOWER COMPANY

405 Lexington Ave. New York 17, N. Y.

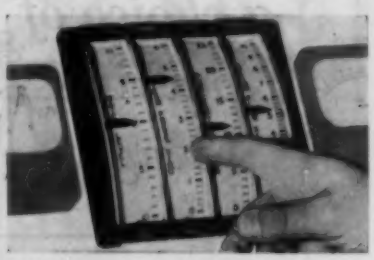
District Engineers in Principal Cities of United States and Canada

Circle 518 on Reply Card for more data

new equipment

—Starts on page 8

make it virtually impossible to waterlog an expansion tank except by loss of air from a leaky tank or normal air absorption into the water itself.



Miniature remote indicator is easy to read

L41 Removable units, easy "one-man" zero adjustment, no parallax, internal illumination, and flush or semi-flush panel mountings are features of the miniature remote indicator announced by The Hays Corp. Indicators can be supplied as electric or pneumatic receivers for measurement of any function such as pressure, draft, or flow. Bulletin 54-175-223 gives further information.

TO GET MORE INFORMATION

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

Unit heaters use steam or water

L42 Suitable for comfort heating jobs where high temperature high pressure steam is used is a series of horizontal Herman Nelson unit heaters, introduced by American Air Filter Co. Capacities range from 385 to 5430 cfm (70 F air), 17,400 to 228,000 Btu per hr (with 60 F entering air and 2 psi steam pressure). Units are also suitable, without modification, for forced hot water heating systems.

Dynamatic Eddy-Current Units can be put to work in your plant or product

This Free Booklet Will Show You How

Dynamatic eddy-current couplings, brakes, clutches, dynamometers, and Ajusto-Spede drives, in use today in practically every basic industry in both plant equipment and end products, are proving the ideal solution to difficult speed control and testing problems. Advantages include instantaneous response, infinitely adjustable speed control, wide speed range, quiet operation, low power loss, low maintenance cost, adjustable speed from an AC power source.

Our new booklet "Bulletin GB2" describes and illustrates the basic Dynamatic eddy-current units, including the new stationary field coupling. The text, augmented with illustrations and graphs, describes the basic eddy-current principles and drive characteristics. If you are interested in modern speed control, write for your copy of the new Dynamatic Bulletin GB2.

DYNAMATIC® DIVISION

EATON MANUFACTURING COMPANY

KENOSHA, WISCONSIN • General Offices: Cleveland, Ohio

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letters

. . . from readers

Water Tower Maintenance

Gentlemen:

I thought your article in the August 1954 edition on water towers was very good. It is a subject not many people think about — but important.

Would you be so kind as to answer a few questions . . .

For instance, what particular asphalt base paint did you have in mind? Do you recommend its application on all interior surfaces including the roof? What thickness of paint film is best?

What about the opinion I have heard that the heavy rust scale should not be removed since it provides a protective film on the interior metal surface?

I have attempted to repair riveted tanks but always found that, when welding down a few rivets, the adjacent rivets leaked. Thus all rivets had to be welded or the leakage tolerated. Could you please expand a little on your method of using welded repairs on riveted tanks?

Is tank wall and bottom painting necessary if cathodic protection is used?

L. W. Poll
Maintenance Engineer
Silicone Products Dept., Chem. Div.
General Electric Co.
Waterford, N. Y.

—The inquiry was forwarded to Mr. W. D. Palmer, Protective Coating, Engineering and Inspection Service, who replied, in part, as follows:

"I cannot name the particular asphalt base paint the author has reference to; however, his text plus the reference to the need of annual inspections and touch-up are typical of both asphalt and coal tar products produced by leading manufacturers for this purpose. One manufacturer of such asphalt coatings is the American-Marietta Co., Valdura Div., Chicago 11, Ill.

"They offer two formulations. [For] Salvc, which is of paint consistency, they recommend a minimum of two coats.

". . . The second formulation is heavier. It may be brushed or sprayed. The manufacturer recommends only one coat, or a first or prime coat of Salvc or red zinc chromate primer followed by a single coat of the second formulation.

"Coal tar formulations suitable for fresh water storage tanks are offered by the Koppers Co. and the Pittsburgh Coke & Chemical Co. These coatings will not adhere properly to rust scale or damp surfaces.

"It is necessary to paint the entire area of metal exposed in the inside of the tank including the roof. The cathodic installation will only function at and below the water level. Corrosion will be found taking place on steel at and above the waterline.

"It is necessary to chip or scale heavy rust scale before sand blast-

Pick INSTANTANEOUS HOT WATER HEATERS
ENGINEERED FOR SERVICE
Industries everywhere are replacing outmoded water heaters with Pick Instantaneous Water Heaters. Here are the reasons:
★ Water Is Heated Instantly. Entirely automatic, Pick Heaters operate by steam injection to heat the water in a flash to exact temperature desired and in volume required.
★ Fuel Savings Are Substantial. Steam injection heating is the most efficient method known. There's no waste because water is heated only as used . . . never stored and allowed to cool.
★ No Storage Tanks Required. Compact design of Pick Heaters permits out-of-the-way installation in corners, on walls or overhead. Saves valuable floor space.
★ Exact Temperature Control. Pick heaters can be operated at low or high loads with minimum temperature fluctuation. And it's done quietly.
★ Maintenance Cost Is Low. Pick Heaters can be cleaned in a matter of minutes — worn parts easily replaced.
★ Installation Is Inexpensive. Only ordinary pipe connections are required.
PICK HOT WATER HEATERS . . . Used by
• United States Steel Co.
• Ford Motor Co.
• H. J. Heinz
• Bethlehem Steel Corp.
• Hercules Powder
• Wilson & Co.
and MANY OTHERS
Pick
SAVES MONEY FOR ANY INDUSTRY THAT USES HOT WATER!
Write for booklet on how PICK HEATERS cut costs of Hot Water — No Obligation. Write IP 654
PICK MANUFACTURING CO. • WEST BEND, WIS.
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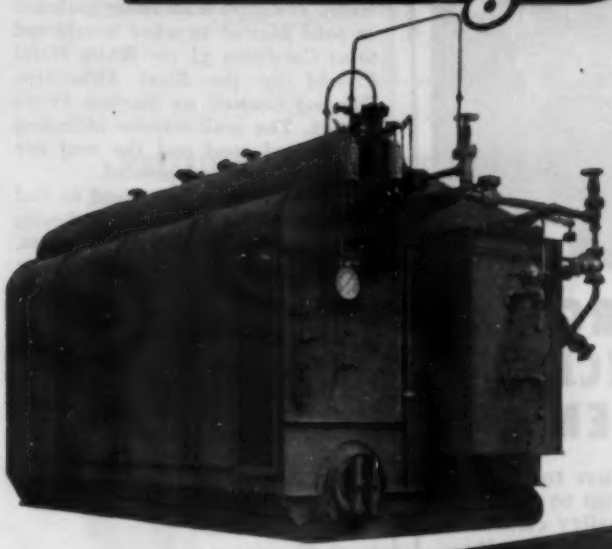
Vogt

Gas Fired
PACKAGE UNIT
Steam Generators
selected by
PHILLIPS CHEMICAL CO.
Pasadena, Texas Plant



TOP: One of the completed units prior to shipment.

BOTTOM: Shop erection view shows tile and block insulation in convection wall; also main baffle tile and furnace floor tile.

Principal Data, Each Unit

25,000 pounds steam per hour capacity. Induced draft type.

Fusion welded steam and water drums designed for 425 pound S.W.P.

Completely shop assembled and required only the piping and gas outlet connections to place them in operation.

Fully steel encased for outdoor installation on a simple foundation.

■

**Vogt Steam Generators are available in bent tube types and straight tube forged sectional header types for solid, liquid or gaseous fuels. Bulletins on request.*

HENRY VOGT MACHINE CO.
Louisville, Kentucky

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

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PORTFOLIO OF BIRD-ARCHER ENGINEERING SERVICES FOR WATER TREATMENT

For experienced counsel and personal attention to water or steam problems at your plant, it will pay you to call on Bird-Archer's qualified engineers. Highest quality chemicals and over sixty years experience assure maximum results with Bird-Archer's Complete Water Treatment Service.

PLANT SURVEY
Studies of your use of water or steam equipment and past performance.

WATER AVAILABILITY STUDY
Analysis of water supplies starting at source.

LABORATORY SERVICE
Experienced chemists specialize in scientific water analyses and research.

DEVELOPMENT OF TREATMENT AND CONTROL SYSTEMS
Operational changes where necessary.

CHEMICAL TREATMENT FORMULATION
Bird-Archer custom formulates chemical treatments for your specific problems.

EQUIPMENT RECOMMENDATIONS
Specification and furnishing of additional equipment when necessary, including complete analysis of savings and benefits made possible.

PLANT STAFF INSTRUCTION
Experienced technicians instruct your personnel in accurate control and test procedures.

PERIODIC CHECK-UPS
Personal call-backs to your plant by a Bird-Archer Service Engineer to assure best possible results.

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For Power For Process For Cooling

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BIRD-ARCHER COMPANY OF CALIFORNIA, San Francisco

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letters

—Starts on page 30

ing. Care must be taken to prevent gouging and damaging the sound metal. The steel is all either pickeled or sand blasted to what is referred to as Condition #1 (or White Metal Finish) by the Steel Structures Painting Council on Surface Preparation. The tank interior including all exposed steel and the roof are [then] primed and painted.

"I am not at all surprised to find that you have experienced difficulty in stopping leaks around rivets. Since rust and scale is porous it naturally absorbs and retains considerable amounts of moisture. Therefore, heating while welding adjoining rivets would be expected to convert the entrapped moisture to vapor which would expand, crack, etc. the rust scale deposits.

"Heavy rust and scale formations . . . may reduce the corrosion rate but do not prevent corrosion to steel."

Equipment, Not Men

Dear Sir:

I subscribe to *American Machinist* and *Factory Management and Maintenance*. About 15 other publications are handed down to me by the Works Manager including INDUSTRY AND POWER. Although I find many items of interest in your publication it leaves me with the feeling there is something missing.

It is like a cold blueprint. It does not contain enough humanics (*sic*). I occasionally walk into the office and find the boss reading the comics. Another executive is reading human relation problems. Others like myself first read the editorials and practical ideas. I hope you accept this letter in the spirit it is written as a suggestion. I sincerely believe you could increase your circulation by additional departments. No one can complain about your fine publication on latest developments, designs, and general engineering. These new developments would be useless without men, and an understanding of human problems.

A. E. Salmons
3442 Bowman Street
Philadelphia, Pa.

—We plead guilty. I&P deals only with equipment not with men. Our editors are engineers, not psychologists. But we don't want to seem cold—a fire is being lit beneath each editor.—Ed.

WHEN TO USE A CONTROLLER

PRESSURE, TEMPERATURE AND LIQUID LEVEL CONTROLLERS

Leslie Controllers consist of a single or double seated diaphragm control valve operated by a Control Pilot. The latter is an air, water or oil actuated device that produces a variable loading pressure to the valve diaphragm in response to a pressure, temperature or level change in the controlled medium. Controllers are used for any one or any combination of the following conditions:

★ When an exactly controlled level, preasure or temperature is required.

★ When power is needed to assure automatic valve opening after prolonged, tight shut-off.

★ When power is needed to operate single-seated valves under high pressure drop.

★ When the available fluid pressure differential doesn't supply enough power for self-operation.

★ When extreme pressure reductions are necessary (i.e. 600 reduced to 10 psi, 900 to 2 psi, 2150 to 5 psi); all can be handled in one step.

★ When fluid contamination requires the simplest type regulating valve for dependable operation.

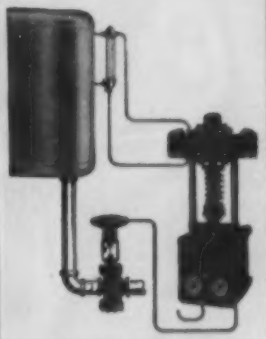
★ When operation from either a nearby or remote control station is desired.

Control Pilot
Type PD

LESLIE
CONTROL PILOTS

Simple mechanical device employing constant supply of clean air, gas, water or light oil at 20-22 psi to produce a variable output or loading pressure of 0-20 psi in response to a level, pressure or temperature change applied to operate a control valve or power cylinder controlling fluid flow.

SEND FOR BULLETIN 5303



Floatless Level Control
Type UA-1

LESLIE
FLOATLESS LEVEL CONTROL

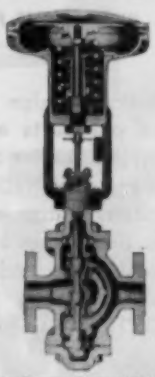
Provides accurate control of liquid level (plus or minus 1" water column). Eliminates problems caused by troublesome linkages, torque tubes, floats and stuffing boxes. Simple design provides steady, positive, precise control even under difficult conditions. Consists of Level Control Pilot and diaphragm control valve.

SEND FOR BULLETINS
5303, 5304, 5305

LESLIE
DIAPHRAGM CONTROL VALVES
(Double Seated)

Flow-line contoured body for high capacity, low pressure drop. Standard ISA face to face dimension in cast iron, cast bronze and cast alloy steels. Renewable, self-aligning guides. ½-10". To primary service rating of 600 psi—950° F. flanged, ring joint and welding ends.

SEND FOR BULLETIN 5305



Diaphragm Control Valve
Double Seated Class DV

LESLIE
DIAPHRAGM CONTROL VALVES
(Single Seated)

Control flow of steam, liquid, air or gas. Tight shut-off. Operated automatically by air, water or oil pressure supplied from a Control Pilot or from a loading device such as LESLIE Air Loading panel. Available in unbalanced or fully balanced types, ½-10" in cast bronze, cast iron and cast alloy steels. Primary service ratings to 2500 psi, 1000° F.

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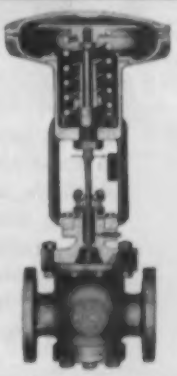

Diaphragm Control Valve
Single Seated Class DL-1

LESLIE CONTROLLERS

SINCE 1900

"STILL FAR AHEAD IN QUALITY AND PERFORMANCE"

LESLIE CO., 263 GRANT AVENUE • LYNDHURST, NEW JERSEY

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save from the start

replace your castings with flame cut parts

SHAPES CUT FROM PLATE — UP TO 16" THICK

If your casting has two flat sides and a perpendicular edge in almost any shape, it can be cut out of steel plate by FOSTER. Flame cut parts are better than castings in some applications because they are lighter in weight, easier to machine, have greater strength, and cost less money. Shown above is a group of National Cylinder Gas flame cutting machines in operation. By using such modern equipment, FOSTER is able to mass produce shape cut parts at reasonable prices. Sometimes a casting can be replaced by a weldment. Two or more parts cut from steel plate and welded together may often present a considerable saving over a similar casting. Any reasonable shape from 1" square to 8 square feet can be cut by FOSTER — to your exact specifications.

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GIVES YOU ANY RPM—
AND ONLY 14¼" HIGH!

FRACTIONAL HORSEPOWER

VARIABLE SPEEDS—IN SMALLEST PACKAGE

HERE'S the new variable speed motor that cost-conscious plant operators have long sought. It's the light weight U. S. Varidrive, Type VA, compactly dimensioned to occupy least space, yet suitable for rugged industrial duty just like the larger HP Varidrive line. Compact dimensions and light weight now make built-in application of variable speeds practical. You can mount it right on your machine, close in; or in any position on floor, wall or ceiling, with or without remote control.

4 TO 10,000 RPM IN RATIOS UP TO 10:1

US MOTORS

TYPE VA
¼ to ¾ h.p.

Quick, Accurate Dial Control

Full speed range instantly obtained in less than one turn of dial handle. The stationary dial plate is precisely calibrated for close speed setting, yet easily visible from a distance.

Gets You More Production

You can greatly increase the performance and output of your machine using fractional horsepower with Type VA. You can now get the exact speeds needed for each operation. Your operator can control the speed to a split rpm to accomplish better workmanship and to actually gain more output. This amazing motor invariably repays its low-cost investment within a few weeks.

14¼" High x 8½" Wide
Weight—87 Lbs.
Easiest Dial Control
Single and 3-Phase

U.S. VARIDRIVE MOTOR

Bulletin Chock-full of Facts

You'll want to study the internal workings of this revolutionary small horsepower motor—see how it works, note the high excellence of materials and the advanced engineering skill that makes Type VA the wonder motor. All the facts are interestingly presented in Bulletin No. 1797. Engineering details and many types shown.

U. S. ELECTRICAL MOTORS INC.
Los Angeles 54, Calif. Milford, Conn.

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new bulletins

. . . catalogs from leading manufacturers

200—Cutting Transmission Costs

Details of how power transmission cost may be cut by using standard Cone-Drive reducers, gearsets and components are available in four-page bulletin 780-54 "Standardized 7 Ways to Cut Your Power Transmission Cost." A condensed chart gives typical horsepower rating at 1750 pinion rpm and weights of units from 2 to 18 in. center distance. Cone-Drive Gears Div. of Michigan Tool Co.

201—Liquid Handling Problems

Useful information related to liquid materials handling problems is included in 108-page catalog I-54 which describes practically every industrial pump made by this company including their new, large capacity deepwell submersible pumps. Construction features, performance, and selection tables are given. The Deming Co.

202—Refractory Concrete

"Refractory Concrete Manual," 16-pages, covers basic information on recommended practice for mixing and placing refractory concrete. Charts and tables put important technical data in a convenient form for easy reference. Lumnite Div., Universal Atlas Cement Co.

203—Chain Drive Handbook

"How to Install and Maintain Hy-Vo Drive," is a handy little water- and oil-proof pocket-size booklet you will want to carry for quick reference. Sprocket installation, chain assembly, chain cases, lubrication, and maintenance procedures are covered. Morse Chain Co.

204—Remote Reading Gages

Eight-page catalog 946 covers in detail the three standard types of Convex Scale and Flat Scale Truscale Remote Reading Gages, showing how these gages bring liquid level indication down to where it can be seen easily — protecting valuable equipment and preventing expensive shutdowns. Jerguson Gage & Valve Co.

205—Tips on Relief Valve Use

Tips on installation and maintenance of relief valves and strainers are included in seven-page catalog section 12-T. This booklet replaces relief valve bulletin 504 and strainer bulletin 505. Edward Valves, Inc., subsidiary of Rockwell Mfg. Co.

Direct Driven Fans

Detailed specifications, performance charts, and dimension tables of the new line of MD direct-driven fans are contained in bulletin MD-101. How these rugged standard and heavy duty fans can be used to advantage in boiler rooms, public buildings, and other locations where peak performance is required is described. **Please send requests directly to Chicago Blower Corp., Dept. IP, 9987 Pacific Ave., Franklin Park, Ill.**

206—Automatic Battery Chargers

Selenium rectifiers especially designed for charging batteries of industrial trucks and similar electric-powered materials handling equipment is covered in four-page bulletin 4530 entitled "Ther Industrial Truck Charger." Charging characteristic graph and useful information about the length of charging time is given. Ther Electric & Machine Works.

207—Temperature Measurement

"How Temperatures are Measured," seven-page pocket-size booklet is an interesting and informative discussion of a subject about which there is a great deal of misunderstanding and confusion. Thermometers, pyrometers, lacquers, crayons, and pellets are discussed. Tempil® Corp.

208—Poly-V Drive

Design characteristics of the Poly-V drive, a single, endless belt with molded lengthwise ribs, are explained in eight-page folder 6638. Line drawings and text compare the Poly-V with conventional drives and point out advantages. Manhattan-Rubber Div., Raybestos-Manhattan, Inc.

209—Mystery of Electronics

To aid you in understanding the fundamentals of electronic temperature controls and their application "The Electronic Control Story," 24-pages, is complete with simplified, easy to understand diagrams. If you are interested in accurate, trouble free, unvarying control of temperatures in any type of structure for any manner of occupancy you will want to read this booklet. Barber-Colman Co.

210—Sweating

Problems of sweating and condensation drip can be solved with the use of this handy 31-page handbook which tells where, when, and how to use Nodrip insulation type coating furnished in plastic form. The booklet is indexed for handy reference. J. W. Mortell Co.

211—Floodlight for High-Bays

How you can get more light with less power using the LS-Flood R40 reflector lamp is explained in two-page bulletin 54. This floodlight is said to be excellent for high-bay installations and needs no metal cover for protection against moisture. Radiant Lamp Corp.

212—Bearing Lubrication

"Industrial Bearing Lubrication," is a reprint from the magazine **Lubrication**, October, 1954 issue. The article covers bearing design, surface, overhaul, and aspects of lubrication. The Texas Co.

213—Sash Maintenance

"Complete Sash Maintenance," 16-pages, is an authoritative discussion of caulking and glazing, painting rusted metal, and sill restoration. Based on actual field experience, it thoroughly explores each subject. The Tremco Mfg. Co.

214—Fire Protection

"For Complete Fire Protection" includes a guide for writing a fire pump specification, diagrams of typical fire pump installations, and specifications for Wheeler-Economy centrifugal pumps, centrifugal booster pumps, and tank filling pumps. Economy Pumps, Inc., Div., of C. H. Wheeler Manufacturing Corp.

215—Pneumatic Conveyors

"Pneumatic Conveying Systems," 11-page bulletin 105, contains many valuable line drawings of conveyor systems in operation at specific plants. Three types of conveyors are shown — vacuum, vacuum pressure, and pressure systems. This booklet will help you decide which type will solve your problems. Convair, Inc.

216—Fire Extinguishing

"Pressure Operated Carbon Dioxide Fire Extinguishing Systems," 11-page bulletin, will tell you by text and drawings all you want to know about the automatic electric type system, how it works, and where it works. Walter Kidde & Co., Inc.

217—The Answer to Rust

"Finally, You've Found the Answer to Rust," is a four-page folder that points out advantages and uses for Ospho, a metal primer applied over rust. Rusticide Products Co.

218—Centrifugal Clutch Coupling

Eight-page bulletin CE-3 explains the 11 new important features of the Twiflex flexible automatic centrifugal clutch coupling. This is not just a catalog, but a collection of valuable engineering data on this type of coupling. The Hilliard Corp.

219—Swivel Joint

Dimensional and operating data on the complete line of ball-bearing swivel joints and other products made by this company are included in 33-page catalog G-4. Typical industrial applications are illustrated showing how each product meets specific needs. Chiksan Co.

220—Choosing The Right Valve

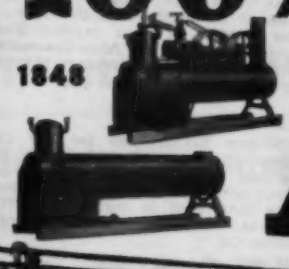
"Choosing the Right Valves," 20-page bulletin, will serve as a handy refresher in the application of basic valve designs. It puts at the piping engineer's elbow a great variety of valve types, each with some special qualification for service. Crane Co.

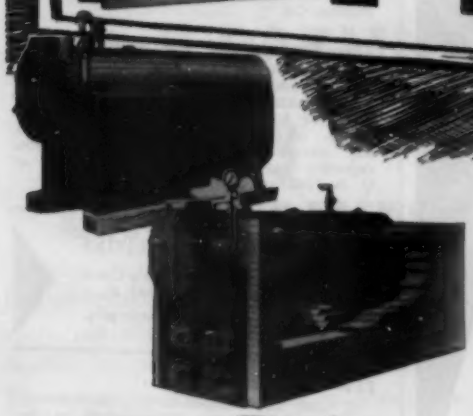
221—Reducing Handling Costs

Of value to engineers in industries that handle dry pulverized materials, 16-page bulletin, "How to Pull Dollars Out of Thin Air," tells how handling costs can be reduced by using the proper pneumatic handling system. This bulletin, G-2 covers

NOTE — Each new bulletin item has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 98/99.

106 YEARS of RELIABILITY ARE BEHIND EVERY AMESTEAM GENERATOR





AMESTEAM GENERATOR

20 sizes, 10 to 600 H.P., 15 to 200# W.P., oil, gas, or oil-gas combinations with quick fuel switchover feature.

In your selection of a boiler, it's important to remember — experience *does* count. And what better assurance of top boiler quality do you have than the Ames record: 106 years of building fine boilers — boilers which have given economical, satisfactory service throughout the industry! Many Ames units purchased 40 to 50 years ago are still faithfully on the job. Amesteam Generators always incorporate the latest advances in package boiler design.

Write today for details on these boilers with the proven record of reliability.

AMES IRON WORKS, INC.

Box F-114, Oswego, N.Y.

Show me how I can benefit from Ames experience and nation-wide organization in getting a top boiler value.

NAME.....

ADDRESS.....

COMPANY.....

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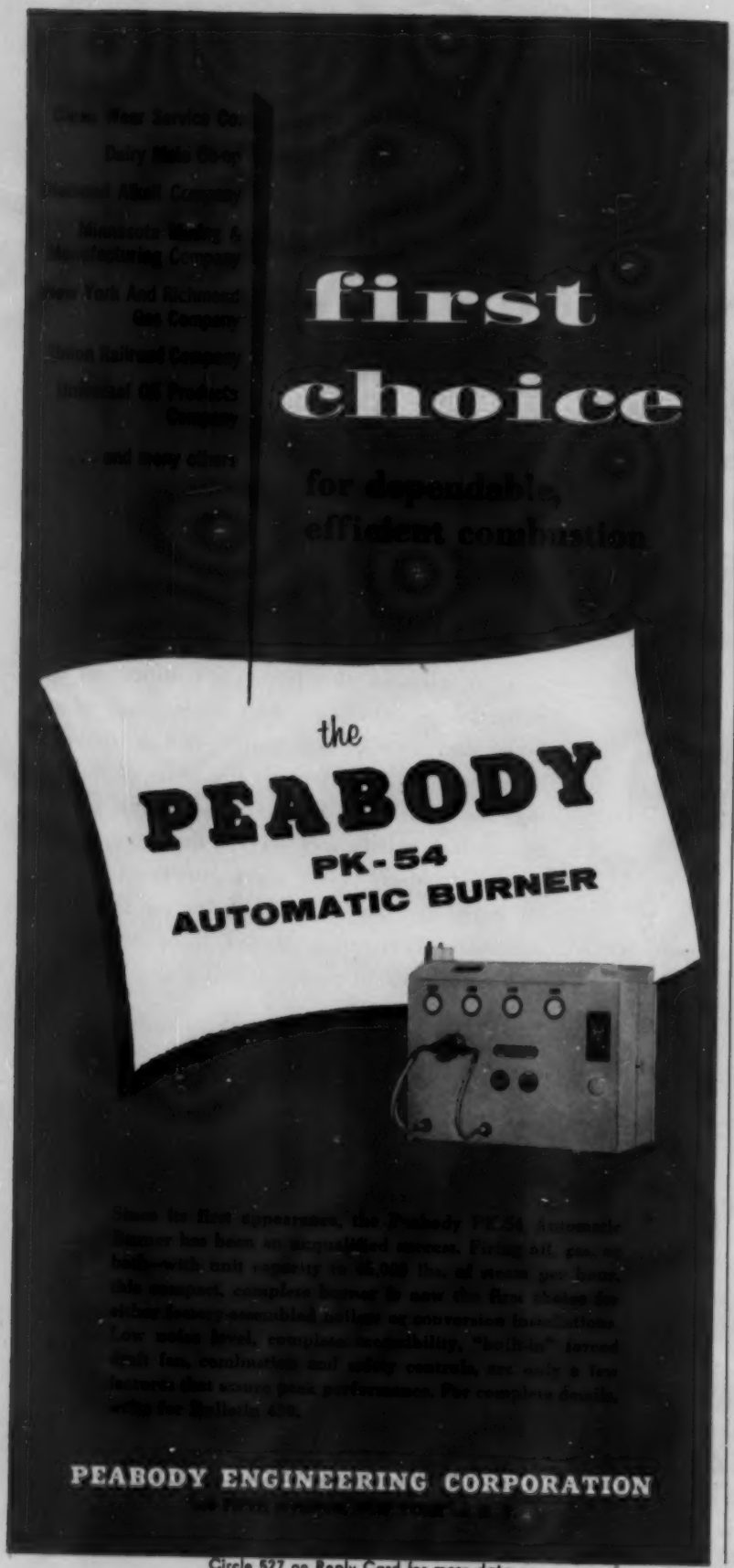

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new bulletins

—Starts on page 38

the rotary compressor, the clinker cooler, and the new kiln preheater. Fuller Co.

222—Trends in Turbine Design

"Today's Trend and Tomorrow's Turbines," six-page booklet 03R8182, gives valuable information on the over-all turbine picture. It is a reprint from the second quarter, 1954, **Allis-Chalmers Electrical Review.** Allis-Chalmers Manufacturing Co.

223—Refractories

"Norton Refractories for the Ceramic Industry," 28-page booklet, lists properties and advantages for specific applications, contains engineering tables and other data used in connection with employment of refractories in this industry. Norton Co.

224—Blowers and Exhausters

Revised 12-page bulletin M-103 describes blowers and exhausters built for applications requiring air pressure from one to 9 lb per sq in., or vacuum from two to 12 in. mercury. It gives design, types, and advantages, with charts that show capacity ranges. Air Appliance Div. of U. S. Hoffman Machinery Corp.

TO REQUEST FREE BULLETINS

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225—Vibration Monitor

A low cost dependable vibration-responsive device, the Vibraswitch, is described in four-page bulletin 500-1. The handy vibration nomograph can be clipped out for future reference. The Beta Corp.

226—Packings and Gaskets

"Chempac Packings & Gaskets," six-page folder, gives pertinent information on each of the several types and on solid Teflon sheets. These packings and gaskets are especially designed for chemical and process equipment. Johns-Manville.

227—Boiler Baffle Data

More than 30 boiler-setting plans are shown, with an analysis of how each arrangement of tubes is baffled to meet the specific boiler design, in 20-page bulletin BW-54. Detailed problems in installation of baffles are also discussed with information on precautions. The Engineer Co.

228—Shaft Mounted Drives

If you use machines that require input speeds between 420 and 10 rpm in the hp range between ½ and 30, you will want a copy of bulletin 7101, "Shaft Mounted Drives by Falk." This eight-page bulletin contains all essential information about these modern gear drives — design data, selection tables data, and installation photographs. The Falk Corp.

229—Water Cooled Lens

The recently developed water-cooled lens for industrial television is described in two-page catalog sheet E. 53. A schematic drawing of a typical installation shows how this device permits continuous observation of combustion conditions while maintaining the camera lens below 120 F. Radio Corporation of America.

DARLING VALVES

INSIDE STORY...

on trouble-free valve performance

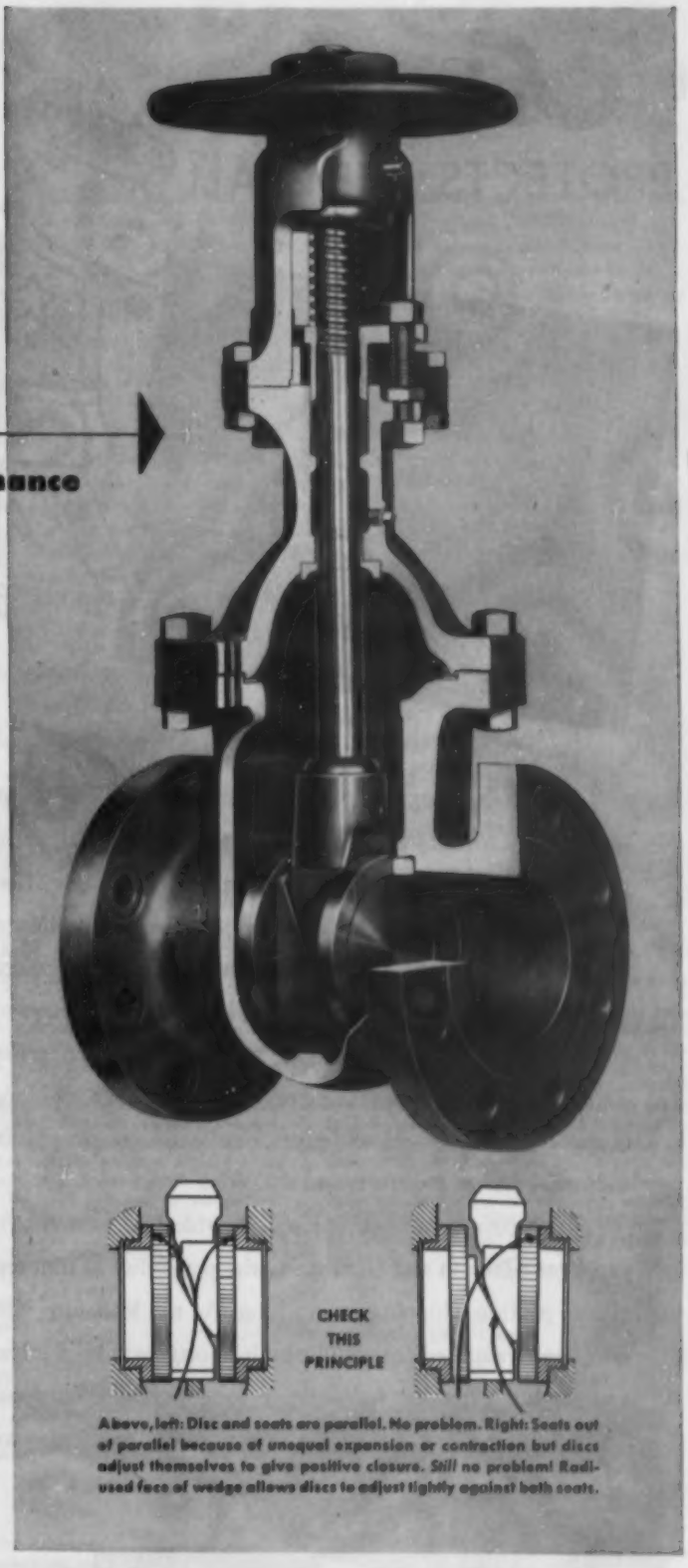
Install DARLING Revolving Disc GATE VALVES

Just what the doctor ordered . . . that's what users say about Darling fully revolving double disc, parallel seat gate valves. *Reason:* These unique valves adjust automatically to compensate for valve body distortion.

Moreover, Darling gate discs, independently hung from the upper wedge and free to revolve completely, change their seating position at each closing. This means uniform wear distribution. Valves work better and last longer, require less attention, less maintenance.

Wide Range Of Sizes And Types

If you're not already a Darling revolving disc gate valve user, let us prescribe the valve you need to cure *your* valve trouble. Darling gate valves come in a wide range of types and sizes . . . and for pressures up to 1500 pounds. Simply outline your particular service needs or ask for a complete descriptive bulletin.



Above, left: Disc and seats are parallel. No problem. Right: Seats out of parallel because of unequal expansion or contraction but discs adjust themselves to give positive closure. *Still* no problem! Radiused face of wedge allows discs to adjust tightly against both seats.

DARLING VALVE & MANUFACTURING CO.

Williamsport 9, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

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Subox

PROTECTS THEM ALL

Oil storage tanks or coal handling equipment...water tanks or ash collectors, metal surfaces everywhere...all are dependably protected against rust and corrosion when the SUBOX PAINT SYSTEM is used. In every case, longer life, minimum maintenance costs, and simplified future upkeep are assured.

Formulated on a rust-inhibitive, lead-suboxide base, every SUBOX & SUBALOX paint thoroughly resists corrosion...is hard, yet flexible enough to withstand rapid and frequent temperature changes; weathers well, and gives excellent protection against industrial fumes, moisture, and abrasion.

Each coat has the same tough durable lead base assuring excellent adhesion and eliminating the possibility of film separation, peeling, chipping or cracking. As the lead film wears thin, the established coat can be built to original film thickness and its life extended for another long period — no special primers or finishers required — with just one single maintenance coat.

Subox Inc.

9 Fairmont Plant, Hackensack, N.J.

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new bulletins

—Starts on page 38

230—Water Testing

"Testing Equipment for Control Water Analyses," 12-page catalog is designed for use as a guide in the selection of water testing equipment. W. H. & L. D. Betz.

231—Cathodic Protection

"Whys" and "hows" of cathodic protection are covered in 12-page catalog section S-6500. This is a complete reference work on the mitigation of corrosion of underground and submerged metal structures by application of an impressed current cathodic protection system using graphite anodes. National Carbon Co., Div. of Union Carbide and Carbon Corp.

232—Water Jet Eductors

Comprehensive information on design, construction, application, and operation of the SK Water Jet Eductors is included in 36-page bulletin 3-M. Monograph permits you to determine whether or not special SK Eductor might be applicable where a standard eductor will not do the job. Schutte and Koerting Co.

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233—Construction Projects

Prepared as a photographic story, "Dravo — Engineering Constructors" shows typical examples of a wide range of construction projects completed by Dravo for steel mills, public works, gas and oil pumping stations, and pipe fabrication and erection. Introduction to the 45-page book explains how the Machinery Division Construction Dept. staff can help you work out your problems. Dravo Corp.

234—Insulation Resistance Tester

Applications in the field of preventive maintenance for the Megger Insulation Resistance Testers are shown in 23-page booklet 21-20. Installation photographs, line drawings, and voltage characteristic curves are shown for motor-driven and rectifier-operator sets. James G. Biddle Co.

235—Heavy-Duty Engines

Complete engine details are given for both the L and F Power Giant industrial engines including power, torque, and fuel curves at various rpm, installation diagrams, and other general descriptive material in 6-page booklet W4-LM. Industrial Engine Dept., Willys Motors, Inc.

236—Cutting Maintenance Costs

Installation pictures and stories in this publication known as "Industrial News," will show you ways of cutting your maintenance costs or increasing production through the use of this company's industrial rubber products. Gates Rubber Co.

237—Temperature Regulators

Where and when to use direct acting, reverse acting, and three way type thermostatic temperature regulators is explained in 12-page bulletin S-6. Comprehensive engineering data is given for the Type S regulator along with instructions for the use of single and double seated valves. Lawler Automatic Controls, Inc.

(Continued on page 100)

Have you a fly ash recovery problem?

Bring it to WESTERN PRECIPITATION

... The Only Organization With Years Of "Know-How" In BOTH *Electrical* And *Mechanical* Recovery Methods!

If you have any kind of a suspension-recovery problem—whether dust, fly ash, fume, fog or mists—it will pay you to bring it to the leading organization in the field . . . WESTERN PRECIPITATION CORPORATION. Western Precipitation not only pioneered, over 44 years ago, the first commercial application of the now-famous COTTRELL Electrical Precipitators, but also has been a leader for many years in the *mechanical* recovery field with its widely-accepted MULTICLONE Collectors.

Result:

Western Precipitation is unsurpassed in the all-important factor of "know-how" in BOTH the electrical and mechanical fields . . . knows from years of first-hand experience whether your particular problem can best be solved by mechanical or electrical methods—*or by a combination of the two* . . . can give you a direct and unbiased recommendation on the matter . . . and then can provide the complete installation under *one* responsibility, *one* overall performance guarantee, even where Combination Multiclone-Precipitator (CMP) installations are made!

Western Precipitation products and services include . . .

COTTRELL

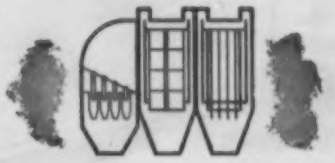
Electrical Precipitators

. . . the most efficient recovery equipment for high recovery, long life, low maintenance on practically any type of suspensions, wet or dry. COTTRELLS can be designed to handle a few c.f.m. —or millions—with equal ease, and at virtually any operating temperature. Recovery efficiencies closely approach 100% recovery, if desired, with very low draft loss, minimum power costs and negligible labor costs. *By all standards, Western Precipitation* COTTRELLS *give highest recovery at lowest cost per-year-of-service!*

MULTICLONE

Mechanical Collectors

. . . the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.



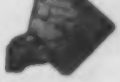
CMP UNITS

(Combination Multiclone-Precipitator)

. . . combine, in *one* compact installation, *both* mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) . . . and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!



Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1016 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA

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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

MULTICLONE—T.M. Reg.

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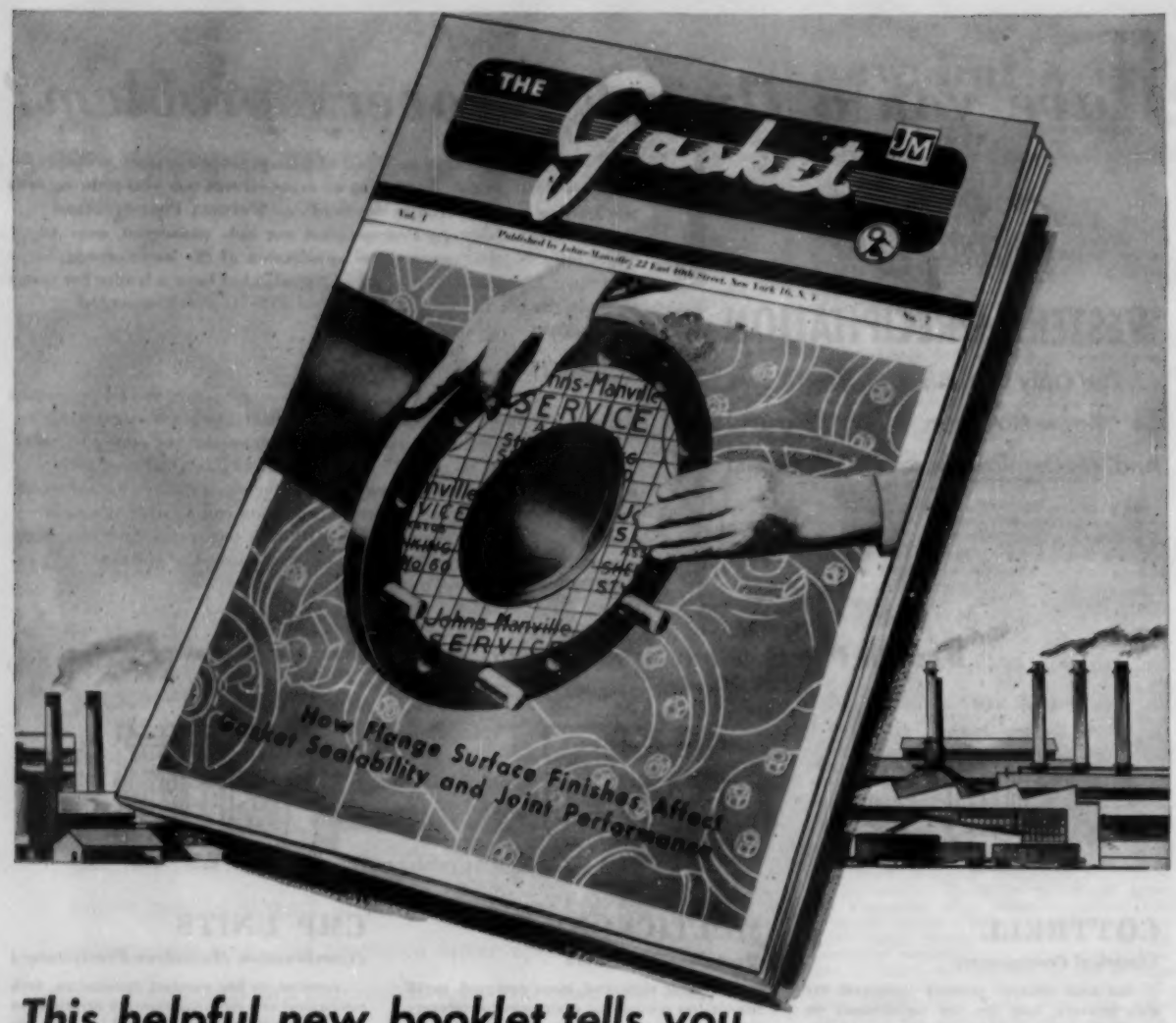

This helpful new booklet tells you

How flange surfaces affect gasket performance

IF YOU BUY, specify or design joints requiring gaskets, you will find helpful information in this new booklet. It provides a basis for selecting the flange surface finish most suitable for a given gasket. It explains why the right finish makes it easy to form the initial seal and obtain the best joint performance in service.

This booklet is the latest in a series of technical publications issued by Johns-Manville under the collective title "The Gasket." It is based on studies made at the Johns-Manville Research Center, largest laboratory of its kind in the world. It incorporates the long experience of Johns-Manville engineers in the design of gaskets such as asbestos, fibre and composition types, asbestos-metallic and all-metal gaskets.

Booklet offered without charge

To secure your copy of this study, write for "The Gasket," PK-48A No. 7. Address Johns-Manville, Box 60, N. Y. 16; in Canada, 199 Bay St., Toronto 1, Ont.

JM PRODUCTS

Johns-Manville PACKINGS & GASKETS

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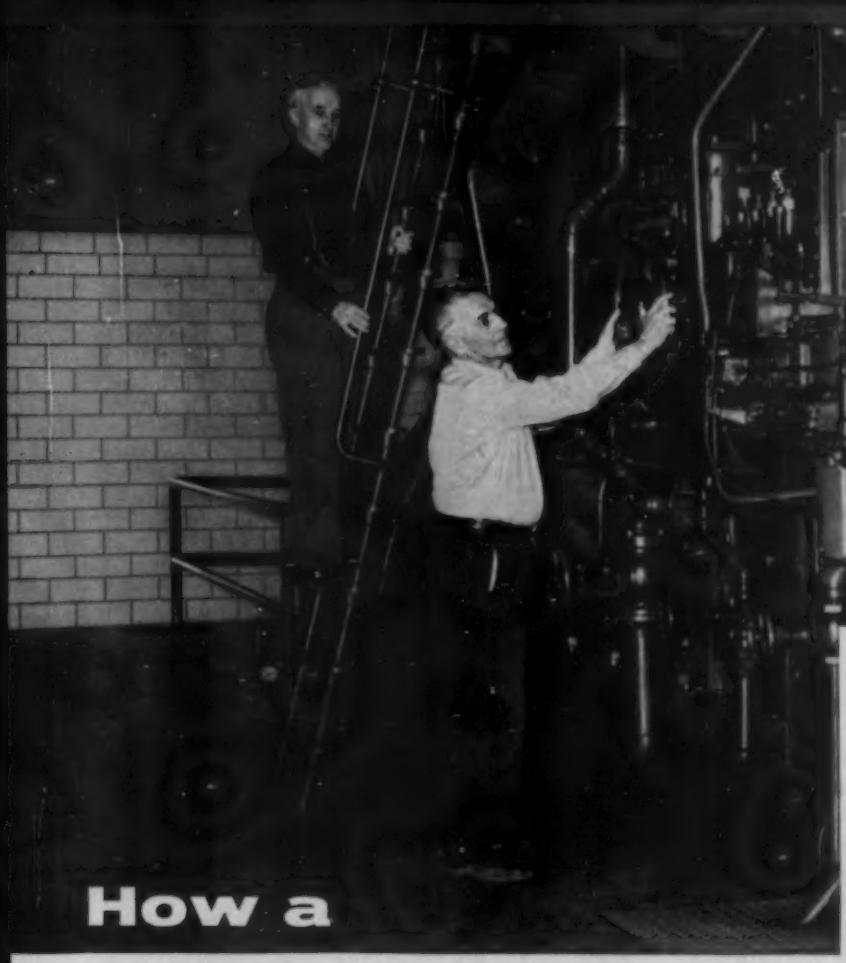

Standard Oil lubricating engineer S. C. Field (left) inspects one of Lakefield's diesels with Plant Superintendent A. C. Krause.

How a "sightseeing" tour solved our lubrication problem!

• A few years ago the diesels supplying power for the Public Utilities Plant, Lakefield, Minn. needed frequent cleaning and overhauling and still did not operate at rated capacity. Ring-sticking and deposits were persistent. Several oil switches failed to make any improvement.

Then a Standard Oil lubrication engineer took the Lakefield superintendent on a visit to other nearby plants where similar problems had been successfully licked. In these plants all engines were running on STANDARD HD Oil. In all cases rings were found to be free—deposits completely absent.

Soon after this "sightseeing" tour, one of the Lakefield engines was test-run on STANDARD HD. In less than six months it was thoroughly cleaned up and running at rated capacity. Naturally, Lakefield's other diesels were all switched to STANDARD HD Oil soon after and have been running trouble-free ever since.

If you've got a lubrication problem and would like to see how other plants licked the same kind of trouble, check with your nearest Standard office. Or write to Standard Oil Company, 910 S. Michigan Ave., Chicago, Illinois.

STANDARD HD
TRADE MARK
OIL

STANDARD HD Oil keeps engines running better. It's specially made to minimize wear in vital operating parts . . . keeps engines operating at peak efficiency by keeping engines clean. Try some today and see why more and more midwest plants are running better on STANDARD HD Oil.

STANDARD OIL COMPANY

STANDARD

(Indiana)

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Why Put Up with Water Problems?

MOGUL Solves Them * Surely and Economically

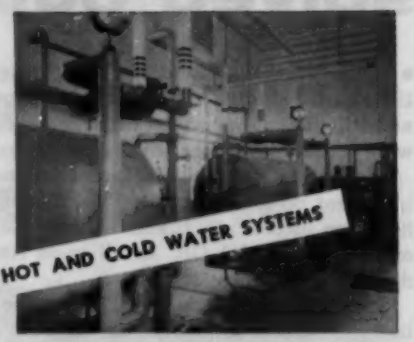
Are you putting up with expensive shut-downs and repairs that you take for granted are necessary to correct your water problems? If you are, Mogul can save you time and money.

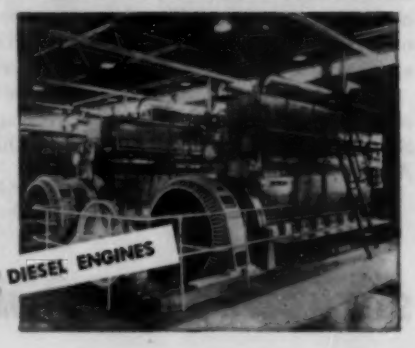
Mogul makes mechanical cleaning unnecessary by preventing formation of hard deposits and scale and eliminating rust and corrosion. Foul up of cooling systems by algae and congestion is ended.

Because no *one* material can correct all water problems, Mogul selects a formula and applies it in amounts calculated from a water analysis of the particular job. Regular inspections by a Mogul man assure top efficiency and low cost.

Why waste time and money on periodic shut-downs for cleaning when Mogul can end them? Call in a Mogul Service Man to study your water problem. He's glad to survey the whole system and show you how Mogul eliminates water troubles. Fill and mail the coupon today. There's no obligation.

The North American MOGUL Products Company
Cleveland 13, Ohio





The North American Mogul Products Company
Standard Building, Cleveland 13, Ohio

Send me information on Mogul Treatment for applications checked.

- ☐ Steam and Return Lines
- ☐ Air Conditioning
- ☐ Hot Water and Steam Heating
- ☐ Hot and Cold Water Supply Systems
- ☐ Cooling Water Systems
- ☐ Wet-Type Dust Collectors

Name _____

Title _____

Company _____

Address _____

_____

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LOWEST COST PER POUND OF STEAM

STARTS WITH FEATURES LIKE THESE

OPERATING ENGINEER:
"Ease of maintenance at less cost in time and materials — more dependable year-round operation."
INSURANCE INSPECTOR:
"All-welded construction — approved electronic operating and safety devices . . . meet ASME and Underwriters Laboratories codes."
PLANT SUPERINTENDENT:
"Steam when you need it and in the quantity you require."
CONSULTING ENGINEER:
"Exclusive boiler-burner design gives you highest efficiency even with fluctuating loads, down to 30% of rating."
ARCHITECT:
"Compact, space saving design simplifies boiler room planning for single or multiple units."
OWNER:
"Uses oil or gas fuels which are easier to handle, more efficient and lower in operating cost."
CONTRACTOR:
"Boilers shipped ready to install — can be in operation in as little as 24 hours after delivery."
BOILER INSPECTION ENGINEER:
"A large low-furnace design provides greater safety."

"It's NEW — Get The Facts On The CB Boiler — Write Today"

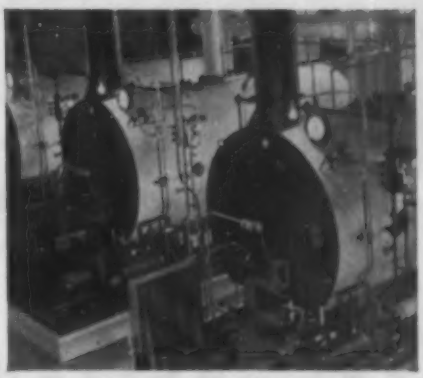
that's why you profit most from Cleaver-Brooks self-contained boilers

● Top to bottom, inside and out, you get more money-saving features when you specify or buy Cleaver-Brooks self-contained boilers. You make an *investment in quality* that pays off in lowest net cost per pound of steam for processing or heating.

YOU BENEFIT from more than 20 years of experience, working closely with men who have made it their business to be *right* about boilers. You profit from complete coordination throughout planning, installing, supervising and final operation.

YOU BENEFIT from self-contained design and original four-pass construction. These Cleaver-Brooks engineered "firsts," plus forced draft, 5 sq. ft. of heating surface per boiler hp, and exclusive burners, all contribute to highest heat transfer. Guaranteed 80% thermal efficiency when firing with oil is the direct result!

Whether you're planning a new steam plant or modernizing, make certain you get the complete Cleaver-Brooks story before you buy. See your Cleaver-Brooks representative, or write for catalog AD-100. Cleaver-Brooks Company, Dept. M-302, 326 East Keefe Avenue, Milwaukee 12, Wisconsin, U.S.A. *Cable Address CLEBRO — Milwaukee — All Codes.*



One typical owner can count on yearly savings ($15,000 fuel and $10,000 labor) from this battery of three 150 hp Cleaver-Brooks self-contained boilers.

●

NOW — FIRST SIZES OF THE CB BOILER ARE MADE IN CANADA, TOO.

●

Cleaver Brooks

ORIGINATORS OF THE SELF-CONTAINED BOILER

BOILERS . . . STEAM OR HOT WATER . . . FOR HEATING OR PROCESSING, IN SIZES FROM 15 TO 500 hp, 15 to 250 PSI.

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THE FINEST DAMPER THAT MONEY CAN BUY

HEACON DAMPERS *are specified* where no other dampers will work

THERMIX HEACON

Where tight shut-off is an absolute requirement . . . where accurate control is vital, Heacon Dampers give you the only positive answer to your problem.

Tight closure is accomplished by a radical method of sealing against the damper frame. Accurate control is provided by V-porting the lower section of the frame to provide practically any flow characteristic required.

In addition to its sealing and control characteristics, because of the unique suspension construction of the sealing curtain, operating torque is not transmitted to the supporting spindle or driving mechanism. This feature makes possible the use of a minimum and practically constant power requirement for damper operation.

Thermix, Project Engineers for Heacon will be glad to help solve your damper problems. Why not contact them today.

Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

(OFFICES IN 38 PRINCIPAL CITIES)

Canadian Affiliates: T. C. Chown, Ltd. 1440 St. Catherine St. W., Montreal 25, Quebec. 983 Bay St., Toronto 5, Ontario, Canada

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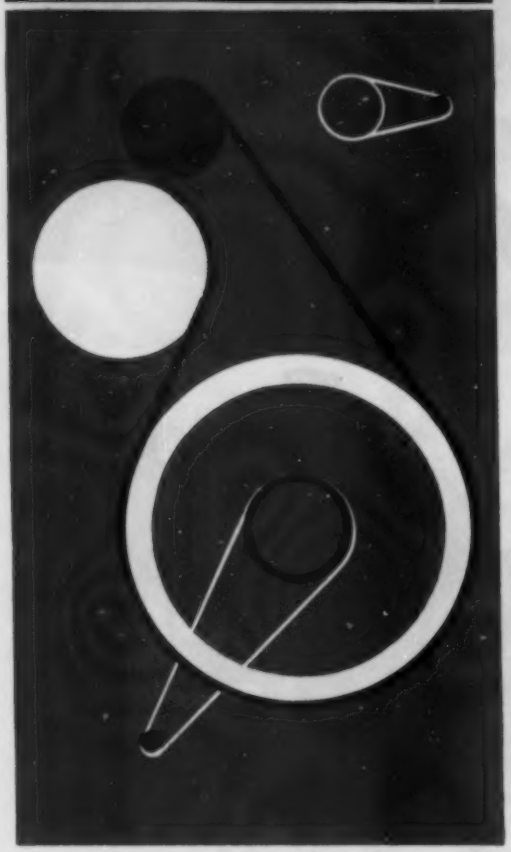
you get "more use per dollar" two ways . . .



with CONDOR WHIPCORD BELTS

These endless belts are cost-savers on all endless drives, but they prove their extra quality on "belt-killer" drives—short centers, small pulleys, reverse bends, high speed and high tension.

Condor Whipcord Belts are practically unaffected by variations in atmosphere—no shrinkage —no stretch—no downtime for take-up.

Extensible-Tip cover-end splice with rubber rivets (shown above) eliminates cover separation, gives belt much longer life—outlasts 2 or 3 ordinary types of endless belts on many drives.

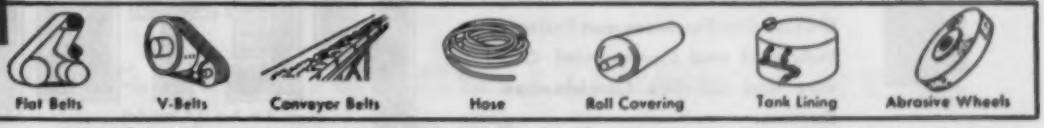
You get "More Use per Dollar" two ways . . . more dependable machine operation . . . longer endless belt life.

Ask the R/M Distributor for Bulletin 6869.

He also can tell you how to get "More Use per Dollar" with R/M hose, V-belts and conveyor belts.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

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MORE HORSES

exactly when you want them... *with a*

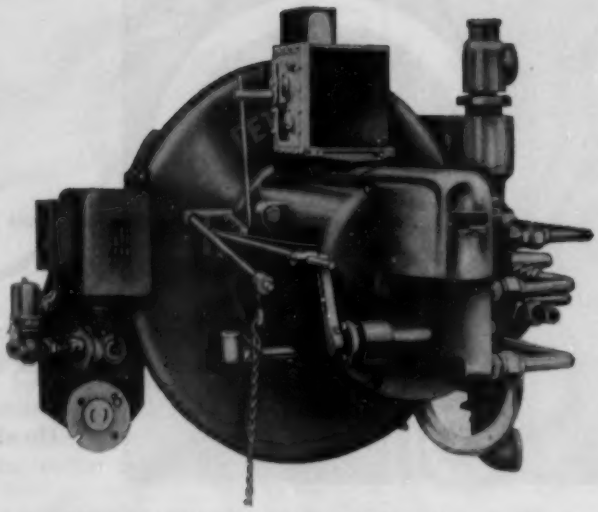
Petro

INDUSTRIAL OIL BURNER

Petro follows fluctuating load demands with speed and reliability...

No matter how the steam demand fluctuates, Petro's modulated firing quickly and automatically meets the need. Never underfires or overfires . . . and throttles down to a steady low-burning rate. But savings don't stop here. Petro industrial oil burners also are designed to use low-cost, heavy fuel oils with complete reliability. These heavy oils (Nos. 5 and 6) actually average 8% *richer* in heat value, yet cost less per gallon.

For economy, for performance, for trouble-free service you just can't beat Petro firing. See the Petro section in Sweet's Architectural File, or write Petro 3029 West 106th Street, Cleveland 11, Ohio. In Canada: 2231 Bloor St. West, Toronto, Ontario.



Rotary type. Burns low-cost heavy fuel oil with complete reliability. Capacities up to 200 gallons per hour. Combination oil-gas models also available, and complete forced draft packaged units.

Residential Oil and Gas Burners, Oil and Gas Furnaces and Boilers, Industrial and Commercial Oil, Gas and Oil-Gas Combination Burners.

PETRO

T.M. Reg. U.S. Pat. Off.

OVER 50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT

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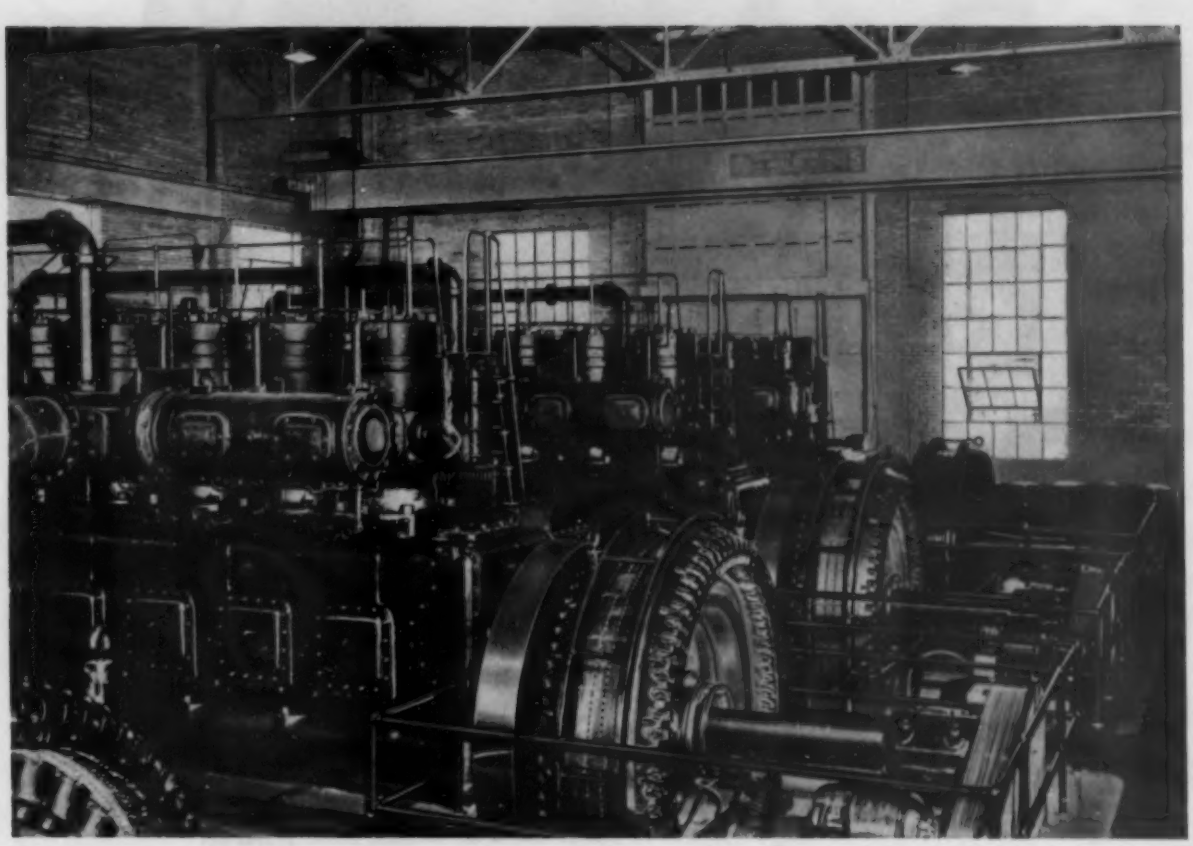

"We're Proud of This Plant!"

says Don H. Decker, — Plant Supt., Thumb Electric Cooperative, Ubly, Mich.

Manager Orville Hurford and Mr. Decker are justifiably proud of their 4-diesel engine generating station. The plant has been an outstanding financial success since the day it was first opened. Several times it has occupied #1 position on the REA Running Plant capacity chart.

Mr. Decker writes, "A large part of our operating success we attribute to Sinclair GASCON® D oil. It has given us an excellent rate of consumption while reducing wear. In fact, *cylinder and piston ring wear is much below normal based on other plants of equal capacity.* Something else we appreciate is the timely visits of the Sinclair Lubrication Engineers."

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Cut-away section of Yarway Impulse Steam Trap showing only moving part, a small stainless steel valve.

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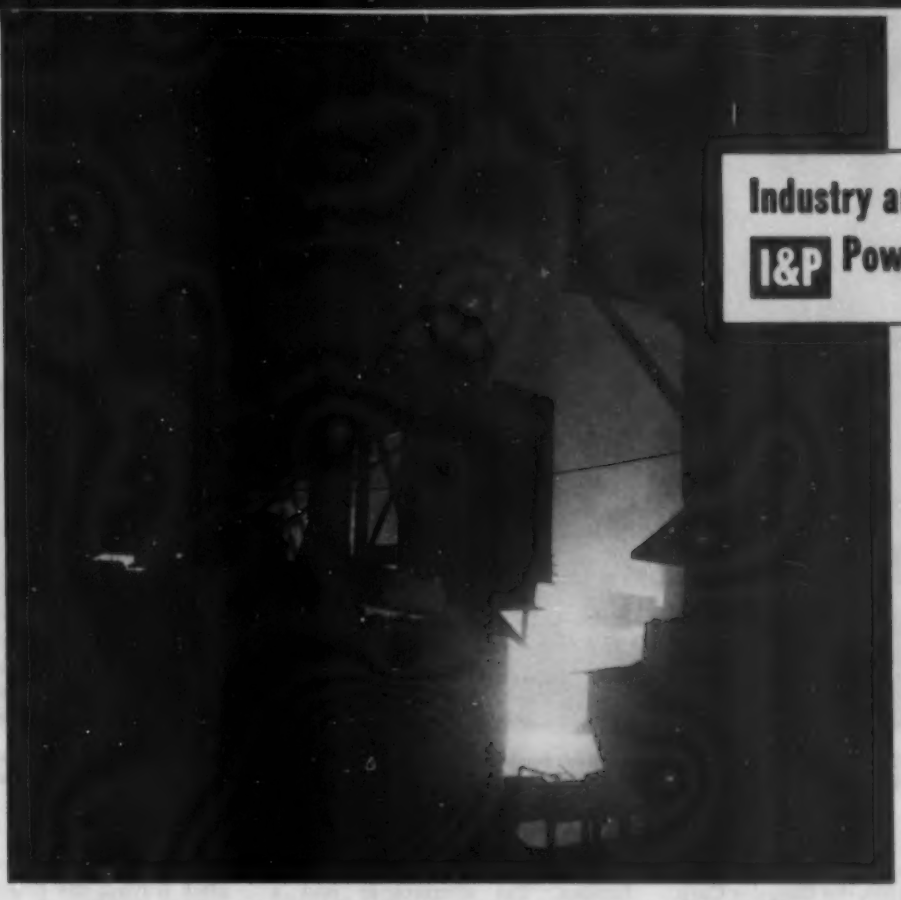


The severe smoke pollution conditions as they existed in the Winfield foundry proved a difficult problem for the various types of smoke collection equipment tried.

No More Smoke Pollution Headache

At Chrysler's Winfield Foundry

I&P EXCLUSIVE

Chrysler engineers tested a group of dust collectors to see which gave the answer to their foundry smoke problem. Here are the actual test results — a comparison of collectors based on the particular conditions encountered at the Winfield Foundry.

AT THE WINFIELD PLANT, camshafts are cast from electric furnace alloy iron. Machine shop cast iron chips and borings with 2 to 10 percent oil on them are charged into two Whiting 3-ton-per-hour electric furnaces at 11-min intervals. A tremendous amount of smoke is created during the charging period of about 2 minutes and large amounts of smoke continue to be emitted during the entire charging and melting cycle. The smoke consists of approximately 75 percent iron oxide, 10 percent silica, and 15 percent carbon impurities.

Initial Installation

The smoke collection equipment installed by the R. C. Mahon Company when the foundry was built in the fall of 1949 consisted of two American Air Filter electric furnace hoods and two type "N" Roto-clone wet dust collectors, each handling 16,000 cfm. Large quantities of black smoke pouring out of the stacks resulted in a violation notice being issued by the Detroit Smoke Abatement Department. Dense smoke inside of the melt house caused complaints from the employees working in that area. However, the equipment installed was unable to comply with the Smoke Abatement

This picture, taken with the smoke collection equipment functioning properly, provides a vivid contrast.

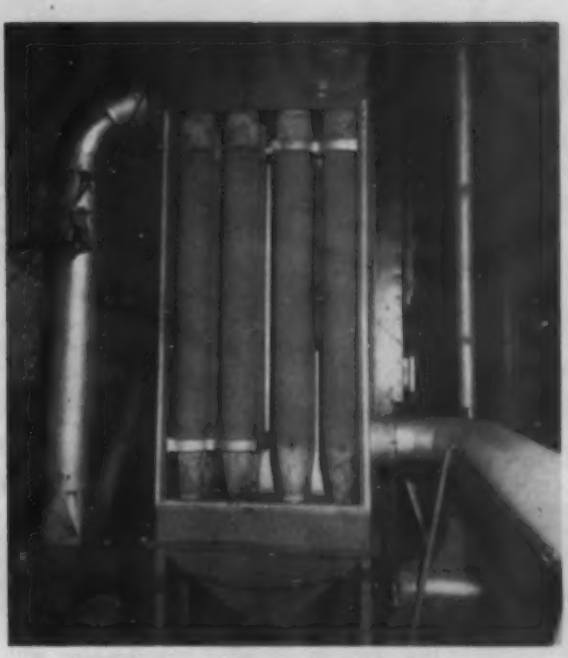
The dense smoke inside the melt house caused complaints from the employees who were working in that area.

Ordinances in force in the city.

In August, 1950, the Chrysler Corp. had installed an American Air Filter Company hood covering the entire top of the furnace. A new 19,000 cfm blower and a sinuous filter aftercleaner were installed on the south furnace. The aftercleaner had a series of corrugated metal filters continually wetted by water spray nozzles. Water was sprayed over the filters at a pressure of 200 psig and the smoke passed through the unit after leaving the original type "N" Rotoclone. The new system was put into operation in December 1950, but the smoke from the aftercleaner was still in violation of Detroit Ordi-

An outside view of the foundry shows the smoke coming out of the stacks and windows before adequate collection equipment was installed. It was necessary to clarify this exhaust to comply with the Detroit Smoke Abatement Ordinances.

Smoke samples for pilot units were obtained from the furnace exhaust at a point near the base of the stack.



A pilot bag house collector unit for filtering smoke has traveling rings for blowing down accumulated dust.

nances regulating stack discharges.

The new hood trapped heat around the furnace top, causing excessive warpage and repairs. The hood itself required weekly maintenance and after an 8-month effort to make it work satisfactorily, it was discarded.

Further Study

In June, 1951, the Engineering Division of the Chrysler Corp. conducted a study as to the nature and size of the smoke particles. Using an electron microscope, it was found that the median particle size was .024 microns, with an average size of .061 microns.

Later, to evaluate the efficiencies and the particle size selectivities of three different types of smoke collectors—a water spray filter, a cloth bag filter, and an electrostatic precipitator—pilot units were tested at the Winfield Foundry in an installation designed to simulate actual service conditions. The layout of the duct system was such that iso-kinetic sampling was possible. Smoke was obtained from the furnace exhaust through the use of an elbow into the duct on the exit side of the centrifugal separator at the base of the stack of the Winfield plant.

The water spray filter unit utilized an inertia type separator, backed up by a cyclone type separator, in which the smoke particles are trapped by high pressure water sprays.

The bag filter had a glass cloth cylinder, closed at one end, and hung open end downward. Dust laden air entered at the bottom of the unit and passed through the sides of the bag. The filtering action was not entirely mechanical. Tests indicated that—in addition to the sieving action—impingement, streamlining effects in the airflow around the bag fibers, and even some electrical effects were important to the filtering.

The electrostatic unit was a two-stage precipitator. The dust particles were charged by one electrode and collected on a second set of charged parallel plate electrodes. The unit tested was not the heavy industrial stack cleaning type, but, due to space limitations and availability of equipment at the time, was of the type used for air-conditioning. Consequently, its capacity was very limited and considerable dilution of the

In order to test pilot units, Chrysler engineers designed an installation in the Winfield Foundry that would simulate the actual service conditions.

input smoke was necessary. Operating voltage was of the order of 10 to 15 kilovolts, with adjustments for variation in the line voltage possible.

Results

Average efficiencies of the units, calculated as percent of dust load removed, were as follows:

Type A-1, water spray filter ..... 74 percent
Type A-2, water spray filter ..... 81 percent
Type A-3, water spray filter ..... 82 percent
Type B, bag filter .... 30 percent
Type C, electrostatic precipitator ..... 81 percent

The particle size selectivity of the water spray unit and of the electrostatic unit were very similar; the cloth bag showed poor efficiency in removal of the fines.

The bag filter was very unsatisfactory both in efficiency and in its failure to remove the extremely small smoke particles that presented such a problem at Winfield. However, only glass cloth was tried by the Chrysler engineers. Felt, wool, cotton, or nylon, might have given better performance. Bag filter installations have been known to be very efficient.

The output air of the electrostatic precipitator appeared clear at all times. However, this seemingly excellent performance was obtained only by diluting one part of input smoke with approximately four parts of clean air. This indicated that the full size unit might be prohibitive in size and cost.

The performance of the water spray filter unit appeared to equal that of the electrostatic precipitator, the latter being generally considered the most efficient collector available for the removal of fine fume.

Actual Equipment Tests

Following the tests, a survey was made to find what equipment might be suitable and a number of types of dust collectors were actually tried at Winfield with these results:

1. *Catalytic Combustion Company Smoke Burner with Catalyst.* This unit consisted of a tube with catalyst inside and a flame heating element. The smoke passed through the flame in the presence of the catalyst but was not noticeably affected, so no samples of the discharge were taken.

2. *R. C. Mahon Company Fog Filter.* The filter had a large cylindrical tank with water spray nozzles spraying water into the tank at a pressure of 600-700 psig. The smoke was introduced at the bottom of the unit and discharged near the top. It operated on the principle that the water would break up into extremely fine particles under 600-700 psig pressure and thus wet the smoke particles and wash them out of the discharge. The unit had an efficiency of 65-72 percent.

3. *Westinghouse Corporation Electrostatic Precipitator.* Using a series of charged plates with 20,000 volts potential between them, the smoke entered at the bottom, passed between the plates, and discharged at the top. A positive charge was imparted to the particles and they were collected on the negatively charged plates. The unit had an efficiency of 78-85 percent.

4. *Whiting Corporation Bag House.* A glass cloth bag was suspended in a housing. The smoke filtered through the sides of the bag at an efficiency of 30 percent.

5. *Western Precipitator Cottrell Electrostatic Precipitator.* This unit had a pipe with a charged wire in the center. The smoke entered at the bottom and the particles were electrically charged as they passed through a field of 60,000 to 80,000 volts potential. The charged particles were collected on the sides of the pipe and sluiced down by constantly flowing water. The efficiency was 94 percent.

6. *American Wheelabrator Bag House.* A series of cotton or orlon bags were suspended in a housing. The smoke passed through the sides of the bags and was collected by the fibers and a filter layer built up by the collected particles. Periodic rapping of the bags was necessary to shake down the collected dust. The efficiency of this unit was 99.9 percent in filtering the smoke.

7. *American Air Filter Bag House.* This unit differed from the American Wheelabrator unit principally in the method of getting rid of the accumulated dust in each collector bag. This was accomplished by a ring with holes on the inside traveling up and down the outside of each bag. Compressed air, blown through these holes into the bag in a reverse direction to the normal air flow, blew off the accumulated dust which fell into a hopper at the bottom of the unit. The efficiency was 99.9 percent.

Tests Supervised

The tests cited were conducted by the Industrial Hygiene Department of Chrysler with a representative of the Detroit Smoke Abatement Department. An engineer from each respective manufacturer was present when his unit was tested to make sure it was operated as recommended by the manufacturer.

The selection of a proper hood to collect the smoke was a difficult problem. The Whiting furnaces each have three electrodes protruding from the center of the furnace. The height of these electrodes above the furnace when new is 12 ft. The furnaces tilt forward to discharge molten metal. The electrodes are changed by an overhead crane which is also used at times to cold charge scrap camshafts into the top of the furnace. The roof of the furnace swings to one side to allow for top charging and repairs. These factors made it exceedingly difficult to design a hood which would collect all the smoke and which would require little maintenance.

Canopy Hood

A canopy hood with a moving center, which covered both furnaces, proved the most satisfactory method of collecting the smoke. Also, the physical structure of the Winfield Foundry facilitates collection by this method.

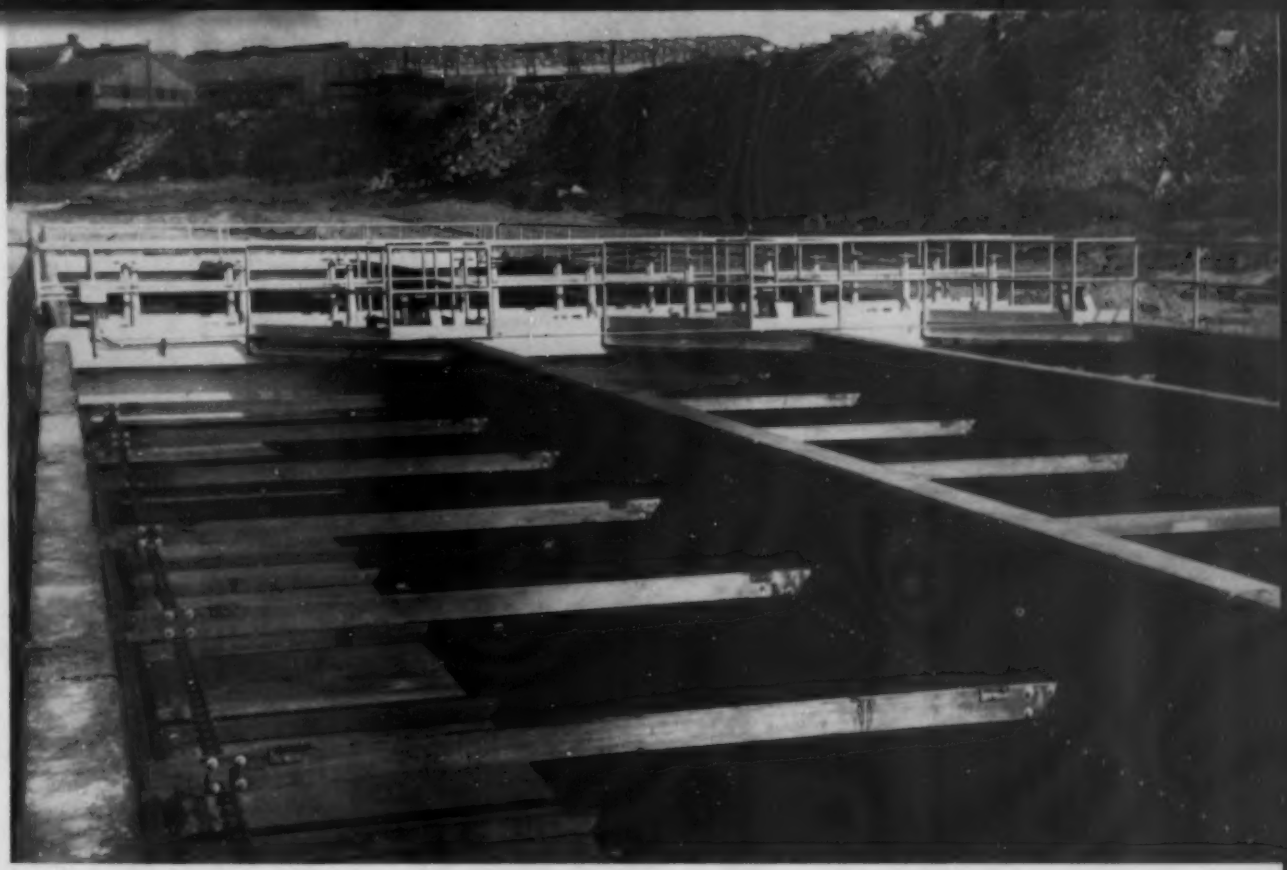
The results of the tests showed that the *Western Precipitator Electrostatic Precipitator*, the *American Wheelabrator Bag House*, or the *American Air Filter Bag House* would meet the air pollution requirements of the Detroit Smoke Abatement Department.

The canopy type hood over the area occupied by the two furnaces, and a 60,000 cfm bag house collector by American Air Filter Company, have proven very satisfactory in controlling smoke from the electric furnaces since the collecting equipment was installed at the Winfield Foundry last year.

It must be reemphasized that these tests were conducted for the special air pollution conditions as they existed in the Winfield Foundry. The equipment cited in the story failed to operate properly only at the Winfield plant and under the peculiar conditions that existed there at the time the tests were made.

Even with the American Air Filter unit that was finally installed, there were various "bugs" that had to be ironed out. One difficulty was that the traveling rings would tear the cloth bags, putting the entire unit out of operation.

Since then, however, all reports seem to indicate that the American Air Filter Co. engineers, working in conjunction with the Chrysler Corp. engineers, have been successful in overcoming the operating and maintenance bugaboos.



California Redwood flights skim oil from the top of the water and scrape sludge from bottom of primary separator tanks.

How We Cleaned Up Our Waste Water

J. E. CULLETON, Chief Engineer, Spang-Chalfant Div., The National Supply Co.

I&P EXCLUSIVE

INDUSTRIAL WASTE water at the Spang-Chalfant plant of the National Supply Co. at Ambridge, Pa., 20 miles down-river (northwest) from Pittsburgh, comes largely from processes used in the manufacture of seamless tubing and tubular products. It contains mill scale, dirt, and sand—all combined with oil and grease. Some of this mixture is actually a black sludge. The waste water is almost odorless. It contains comparatively little acid and no sanitary sewage, both of which are disposed of by other means. Much of the time the effluent has a pH slightly alkaline.

With the recent completion of a new waste water separation plant, an average of 5 million gallons of waste water is cleaned before it empties into the Ohio River. The plant has a capacity for 10 million gallons daily and provisions for a 33 percent future increase in capacity.

The new waste water system is the first of its type to be completed in the Pittsburgh area in compliance with the recently passed state law requiring all industries and municipalities to clean up waste water and remove contaminants from sewage before discharge into the rivers. Spang-Chalfant engineers found no comparable water treatment in similar plants in the area on which to base their design. However, the standard waste water equipment developed by the American Petroleum Institute for oil refineries was found to be suitable, with additional provisions being made for preliminary removal of large volumes of solids.

The new installation occupies nearly two acres of ground in an area 100 ft wide that runs parallel to the Ohio River for 800 ft. The land lies about 25 ft above normal river level and 75 ft below the main mill floor. More than half of this area is occupied by eight earth-work basins or lagoons, each of which is about 100 ft long and 40 ft wide. Sludge and oil (from six separator basins and a scum pit) are pumped into these lagoons by either of two parallel-connected motor-driven pumps, and the waste material is allowed to separate out by evaporation and run-off of the entrained water.

More active parts of the separation system clean the water through several progressive steps. The first separation is by a simple grating that keeps comparatively large solids out of the system. Some unusual objects, such as a large brick furnace-lining, have been caught on the grating.

The next step makes use of a 24-ft square settling basin, the Dorr Detritor, which has a depth of four ft and normal water depths of 2½ ft. Inside, a rotary scraper turning at 0.25 rpm carries settled material towards the outside of the basin. Two

Spang-Chalfant's waste water treating system occupies two acres of ground, approximately 800 ft long by 100 ft wide.

end scoops on the scraper push this material into a submerged trough. Mechanized "hoes" continuously pull the settled matter out of the submerged trough and up an incline. From here it drops to the ground and can be scooped up and trucked away to be disposed of.

In order to prevent turbulence in the Detritor, the water from the 36-in. mill sewer makes a 90-deg turn into the Detritor guided by 15 adjustable concrete deflectors. There is a three ft wide channel around the Detritor connected with the out-flow channel to provide for maintenance. Two screw-operated gates at the entrance corner of the unit control flow through or around it.

Before overflow water from the Detritor reaches the separator basins, it passes through a Parshall flume which permits an accurate measure of the rate of water flow. A Builders-Providence recording flow meter with a one week's continuous recording circular chart is supported on a pedestal beside the flume. It records flow rates in gallons per day. The instrument is protected against freezing in winter by a small electric heater.

Three screw-operated gates at the end of the Parshall flume normally allow the water to enter any of three flumes leading to three primary separators. A fourth opening, presently bricked up, provides for possible future installation of another primary and secondary separator.

Water enters the primary separators by way of 14-ft distribution boxes across the ends of each separator, through nine, 10-in. diameter pipes into the bottom of each box. The water then overflows and drops down through 14-ft film rupture trays (containing beds of 2-in. diameter ceramic Raschig rings) into the main 14 ft by 90 ft settling basins.

The beds of Raschig rings help to separate and break up contaminating material that does not readily separate from the water by gravity. The boxes and Raschig ring beds also serve to prevent turbulence by uniformly distributing the flow across the end of the separators.

Surface oil that accumulates in the flumes at the entrances of the primary separators is occasionally removed by the operator. He lowers, by means of a handwheel, a horizontal, slotted 12-in. diameter drain pipe until the oil flows by gravity through the pipe slots into a square concrete pit or "scum decanter" adjoining the pump house.

Further Settling

Further settling of solids and flotation of oil takes place in the primary separator. Full width scrapers, spaced an average of five ft apart, push settled material in the direction of water flow—at a speed of two ft per minute—into sludge pockets at the far end from which it can be pumped out. Scraper blades become skimmers as the two chains to which they are attached carry them to the the surface of the water and the blades are rotated in the opposite direction. Surface oil accumulates beside the distribution box and is periodically drained off through slotted drain pipes like those in the entering flumes of the system.

From the primary separators the water flows into adjoining ends of secondary separator basins by way of distribution boxes containing shallower beds of Raschig rings than those at the intake ends of the primary separators. The distribution

Scrapers driven by endless chains push the sludge into a hopper at the end of the primary separator.

box is at a lower level than in the primary separator. The secondary separators are 14 ft wide and 127 ft long and have no scrapers or skimmers except slotted, rotatable drain pipes at the far end. The outflow ends of the secondary separators are approximately three inches lower than the intake ends. Water flows by gravity from the lower end through a sump into a 36-in. concrete sewer leading to the river. The sump also receives surface water from a three ft wide concrete trench on the upper side of the water treating system. This trench is 30 to 50 ft from the separator plant.

Collected Sludge

All sludge that is collected at the adjoining ends of the primary and secondary separator basins is pumped into one of the eight lagoons. The pumps can also deliver sludge from the scum pit to the lagoons. When the sludge content of the water is low, it can be delivered directly to the Detritor from either the separator pockets or the scum pit, whichever is more suitable.

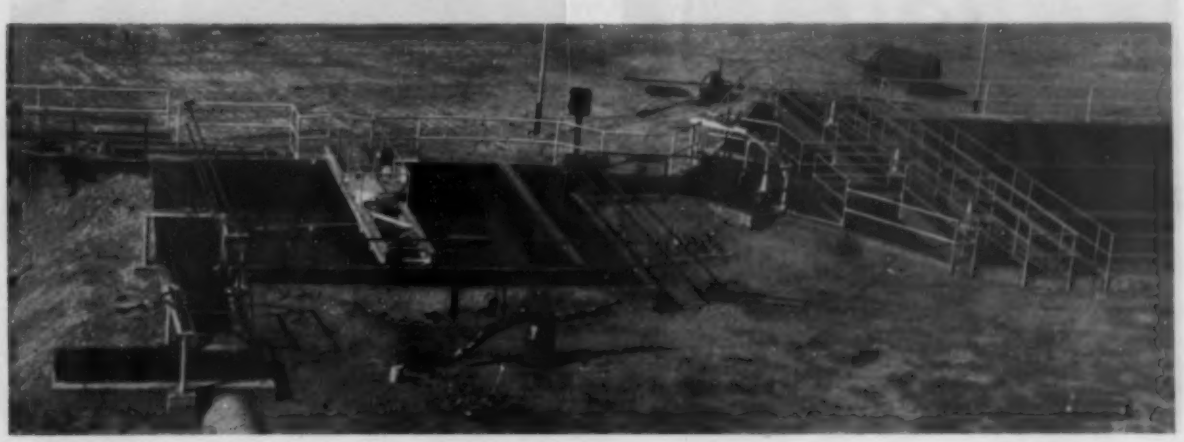
The two pumps are 4-in. Marlow sludge pumps of duplex type connected in parallel to 6-in. suction and discharge lines. Normal capacity is 6300 gph. They have 9-in. diameter plungers that operate with an adjustable stroke from 3.86 to 6.56 in. Maximum working pressure is 65 psi. The pumps are driven by 5-hp electric motors.

Special precautions were taken with the scum pit construction to prevent it from being buoyed up by peak flood waters which have, on past occasions, covered this area. Concrete walls of the pit, which is 19 ft by 21½ ft and 14 ft deep, are two ft thick at the bottom and taper up to a thickness of 1½ ft at the top. The concrete base slab, 25 ft by 22½ ft, is 3-ft thick. Total weight of the empty pit is about 20 percent over maximum possible water displacement.

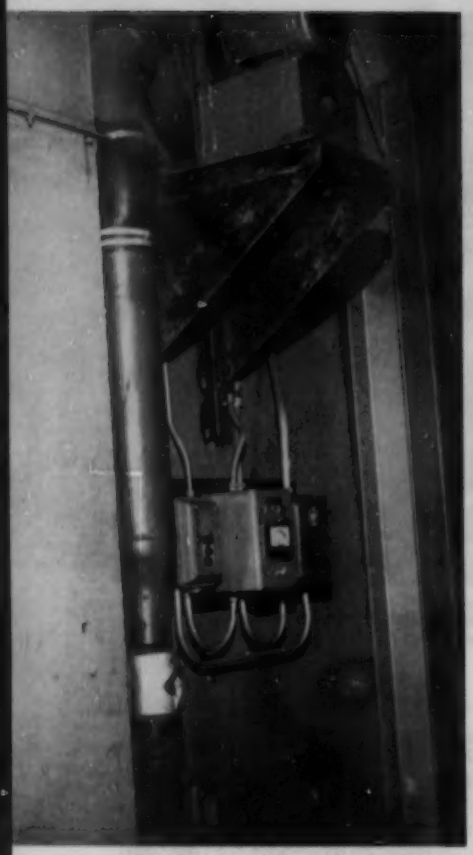
The Detritor mechanism is a rotary scraper turning inside the basin at 0.25 rpm that helps remove the heavier settled solids from the treated water.

It has been impossible as yet to estimate the amount of contaminating material removed by the separator system in any given period of time. However, during five months of partial operation, many tons of material have accumulated in the sump pit, and an approximately equal amount has been discharged by the Detritor and has been hauled away from the plant.

No direct benefit is presently derived by the Spang-Chalfant plant from its water treatment installation. The pipe mill is unable to reuse the treated water that it empties into the river because it has no pumping equipment of its own. Benefits will be gained only when similar installations by other industrial plants and municipal sewage plants on the Ohio, Allegheny, Monongahela, Yougiogheny, and other tributaries above Ambridge, have been made. It is hoped that this eventual cleaning up of the river waters will reduce the amount of maintenance and shutdowns of plant equipment now necessary for cleaning plugged piping.



Mill water enters the system at Detritor (left), over the Parshall flume, flow meter, and into the primary separator.



System for HRT boiler includes fan, air line with butterfly valve and flexible connection, and smoke density indicator.

Overfire Air

More Steam . . . Less Smoke

I&P EXCLUSIVE

W. C. GAUMER, Power Plant Consultant

MODERN stoker-fired, steam generating units include provisions for the efficient introduction of overfire air as an integral part of the design. Properly engineered overfire air systems eliminate smoke, permit higher burning rates, and reduce fly ash discharge and slag formation with consequent increase in the life of the refractories.

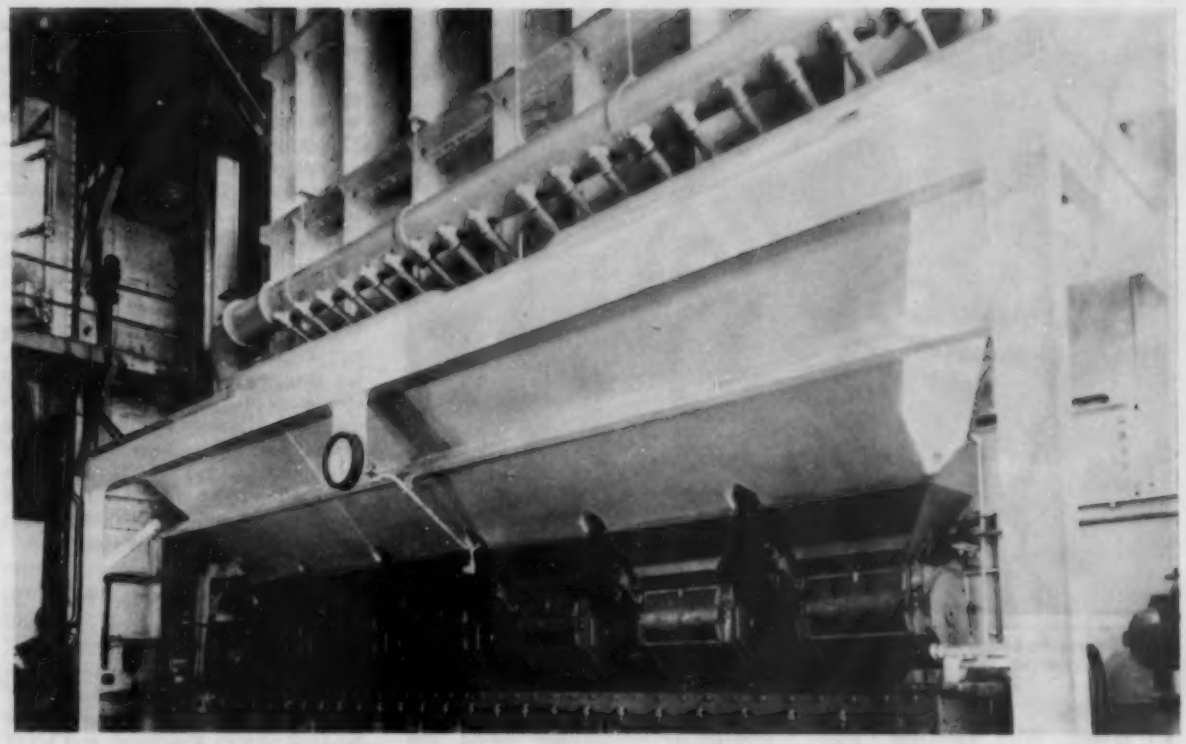
Until the past several years, however, some stoker and boiler manufacturers did not fully appreciate the value of overfire air, so it was left more or less in the category of an ugly stepchild. As a result, many systems were devised somewhat haphazardly in the field, and the manifolds and nozzles were placed wherever entry could be found in the setting. This produced some very odd looking, but nevertheless successful, installations although simply obtaining a fan and placing a pipe in the furnace is not a solution to all operating problems.

While a considerable amount of excellent information is available on the application of overfire air, these data have not been correlated into a formula whereby the results of any particular design can be predicted with assurance. Properly designing an overfire air system for an existing plant necessitates a thorough study of gas flows, temperatures, flame contours, boiler loading, fuel sizes and analysis, stoker characteristics, drafts through boiler passes, air pressures, and amounts and composition of the fly ash. Each installation has its specific problems, and the overfire air system must be designed for those particular conditions in order to obtain maximum efficiencies.

One plant experienced considerable difficulty with very dense

This turbo-blower serves two, 150-hp firetube boilers.

View of the bridge wall shows the spacing of nozzles.

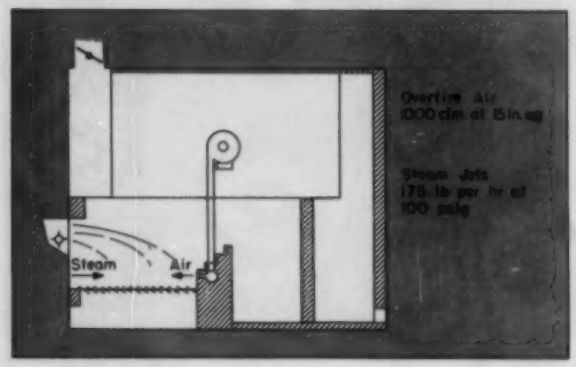


Front overfire air manifold and nozzles are above the stoker hopper on this 150,000 lb per hr steam generating unit.

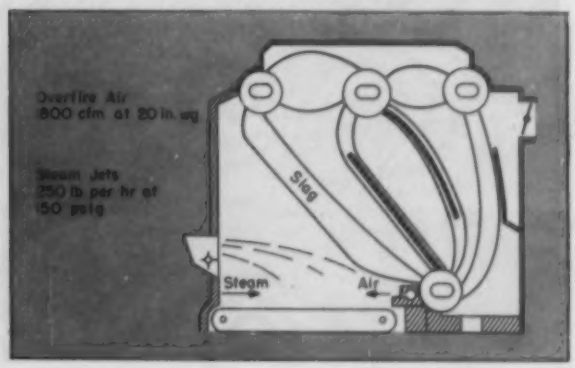
smoke and appreciable fly ash emission at light loads. Steam generating facilities consisted of three, 200-hp, HRT boilers in brick settings, fired by spreader stokers with dumping grates. Boiler controls were of the positioning type. The fuel was a good washed coal, 1¼ in. x 28 mesh, with the top size approximating 40 percent but with some deletion of the middle sizes. Steam demands required the full capacity of all three boilers during the day but dropped off to practically no load during the other shifts. At the very light loads the stack dust loading was exceptionally high, and smoke of No. 4 Ringelmann discharged from 3 to 8 minutes every half hour.

The positioning controls were set in such a manner that the stokers would not feed continuously at light loads with all three boilers on the line. Consequently the fire-bed, with the exception of the extreme edges, was black by the time the steam pressure dropped enough for the fuel feed to come into action. Since there was not sufficient live bed for ignition when the feed resumed, the grate became covered with green fuel — distilling off black smoke for several minutes before proper ignition took place. During this period the forced draft fan was cooling down the furnace, aggravating the smoke condition. When complete ignition was effected, flame travel was long, extending ten feet past the bridge wall and into the fire tubes.

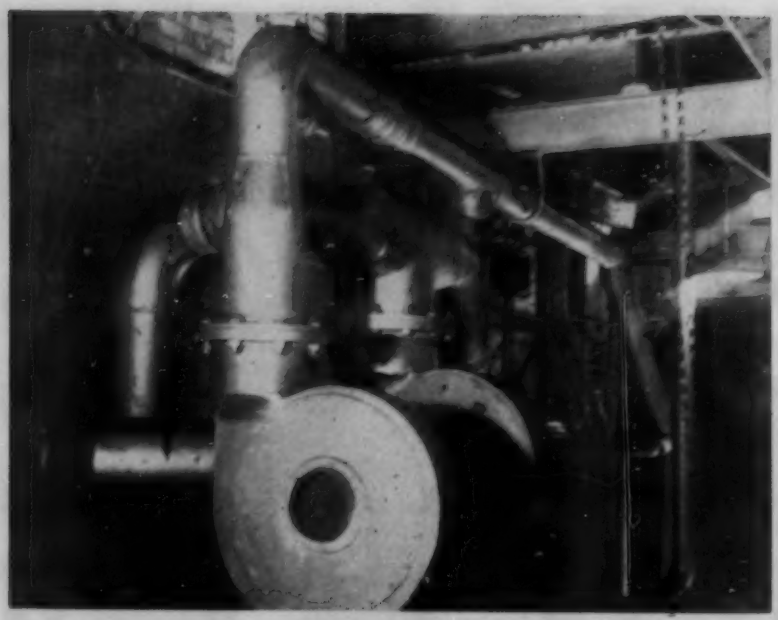
Smoke and dust problems on these boilers were corrected by changing the coal size specifications, adjusting the control range so that the fuel feed was not cut off completely, and installing an overfire



Overfire air applied to a 200-hp brick set HRT boiler.



Overfire air applied to a 500-hp multiple drum boiler.



Separate turbo-blowers circulate air to the front and rear wall manifolds.

air system. With adequate turbulence providing better ignition, the plant was able to operate on two boilers. Stack dust emission now complies with the city ordinance, and smoke density varies between 0.5 and 1.75 Ringelmann.

Paper Mill Installation

A large paper mill in Southern Illinois was confronted with low boiler capacity, excessive last pass temperatures, tube slagging, and dense stack emission. The plant has 500-hp, low set, multiple drum, bent tube, spreader stoker fired boilers. Forced draft fans supply the air for combustion, but gaseous products are removed by natural draft using a single stack. Slagging was severe enough to necessitate taking the boilers off the line after 5 or 6 weeks operation, and refractory life was rather short.

Since the forced draft fans were undersized, 1800-cfm of overfire air at 17-in. wg were introduced to each boiler through manifolds and nozzles in the rear bridge wall. Steam jets were placed in the front walls, four inches above maximum fire depth. With these additions, the operators were able to increase output from 1000 to 1250 hp. Slagging and refractory conditions improved so markedly that the boilers now are kept in service months longer. Stack emission has cleared up to a point where it is no longer a neighborhood nuisance.

Improperly sized traveling grate stokers also can be aided by the judicious use of overfire air. For example, the stokers in one plant were too short to carry the load on 1260-hp, cross drum, sectional header boilers, and top capacity was approximately 75,000 lb per hr with 10 inch feed gate setting.

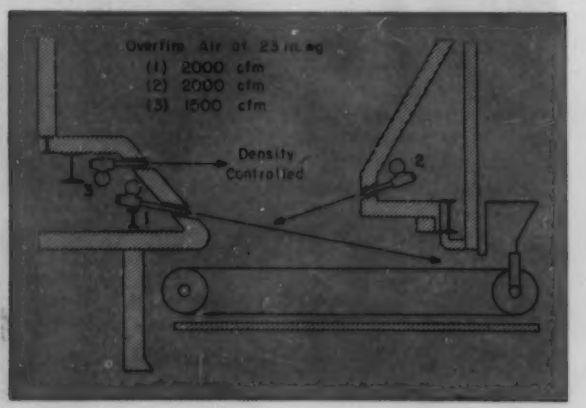
Two manifolds were placed in the rear of the boiler, 24 and 56 inches above the grates, and a front manifold was installed just above the ignition arch. The air quantities introduced were 3500 cfm at 20-in. wg through the rear wall and 2000 cfm at 17-in. wg through the front manifold. Blowers for the front and lower rear manifolds supply air continuously, but the upper rear manifold blower operates intermittently when actuated by an electronic tube scanning the stack.

Increased Capacity

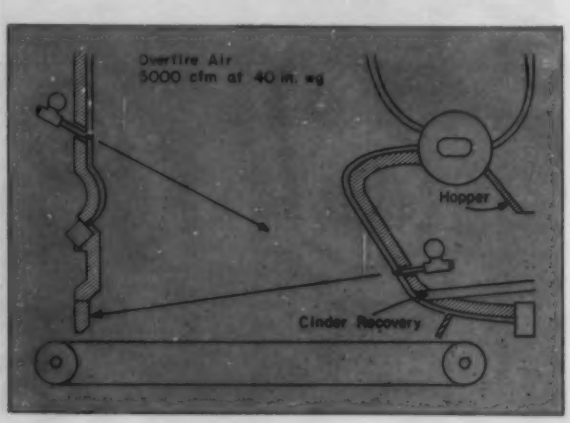
Capacity now is over 90,000 lb per hr with the fuel feed increased to 12 inches, and the flame travel remains below the screen tubes because of the turbulent action of the overfire air. Ash pit losses have dropped to 6 to 8 percent, and slagging in the screen tube section is practically eliminated. These boilers have operated continuously at full load on this system for over 12 years with very little metal loss from dust erosion on the induced draft fan blades. No actual tests have been conducted, but the operators report a substantial reduction in fly ash discharge. Chart recordings from the steam flow and CO_2 meters and analyses of the ash pit combustible confirm the considerable improvement in capacity, efficiency, and operation.

Test Reports

Accurate records of gas analyses, traverse temperature readings, and



Overfire air applied to traveling grate stoker firing.



Overfire air applied to a spreader stoker fired boiler.

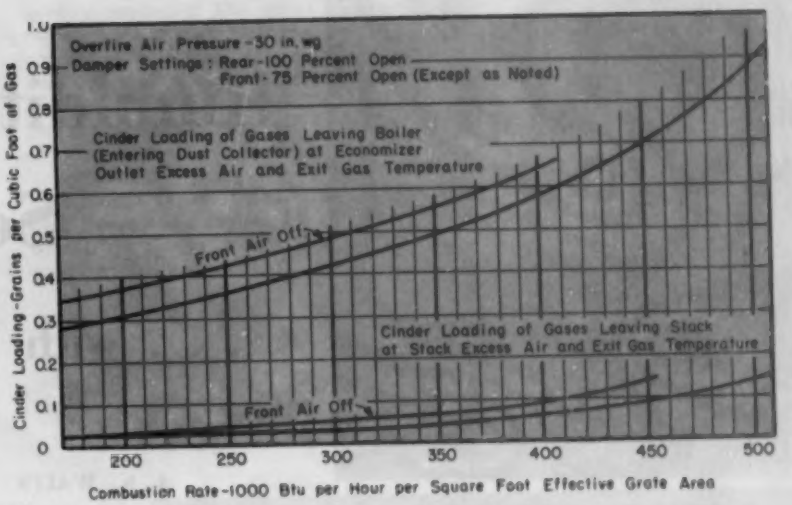
fly ash loading tests provide evidence of the benefits obtained at another plant following the application of an overfire air system to a 150,000 lb per hr boiler fired by a continuous discharge spreader stoker. At this plant the weight and distribution of cinders leaving the boiler were determined from the weight of cinders retained in the dust collector and the weight of the cinders emitted from the stack.

Results of these tests, shown graphically, indicate that stack emission was well within the limits specified by the city ordinance. In fact, test values representative of normal operation at full load compare very favorably with the typical types of regulations governing fly ash emission adopted by the five cities listed in Table 1.

Ash pit, dust collector, and stack samples containing the highest percent of combustibles were analyzed for heating value, and the results are shown in Table 2. These heating values were used in determining unburned carbon losses rather than assuming the combustible was carbon with a heating value of 14,600 Btu. Table 3 is a condensed summary of the test data.

Summary

While the use of overfire air has done much in clearing stack discharge and increasing efficiency and burning rates in some units, it cannot be considered a cure-all for combustion problems. A thorough engineering study of the particular plant must be made, and the overfire air system must be designed for the specific conditions.



Cinder loading vs combustion rate for a 150,000 lb per hr boiler fired by a continuous discharge spreader stoker with a 407 sq ft effective grate area.

TABLE 1 — COMPARISON OF TEST RESULT WITH TYPICAL CITY ORDINANCES

City	Regulation	Test Result
St. Louis, Mo.	0.75 grains per cu ft flue gas at stack temp	0.129
Pittsburgh, Pa.	0.75 grains per cu ft flue gas at 500 F	0.132
Peoria, Ill.	0.40 grains per cu ft flue gas at 500 F	0.132
Detroit, Mich.	0.30 grains per cu ft flue gas at 500 F	0.132
Cincinnati, Ohio	0.85 lb fly ash per 1000 lb flue gas	0.423

TABLE 2 — TESTS OF SAMPLES WITH HIGHEST COMBUSTIBLE PERCENTAGE

	Ash Pit	Dust Collector	Stack
Percent combustible	10.9	41.2	30.8
Heating value, Btu per lb refuse	965	5230	3195
Heating value, Btu per lb combustible	8850	12,700	10,400

TABLE 3 — CINDER CARRYOVER, CARBON LOSS DISTRIBUTION, AND CALCULATED CINDER WEIGHTS AND SIZING LEAVING BOILER

Overfire air pressure, in. wg	29.5	21.0	10.0	29.5	30.5	29.5*	31.1	29.7*	30.7	30.0*
Evaporation rate, 1000 lb per hr	153.0	155.5	153.3	152.7	123.6	124.1	80.8	80.9	48.6	48.6
Combustion rate, lb per hr per sq ft	46.4	48.6	46.3	47.1	37.7	38.5	25.7	25.4	16.0	16.3
Combustion rate, 1000 Btu per hr per sq ft	493.1	507.0	493.0	499.3	397.7	405.4	271.1	267.6	172.9	175.7
Ringelmann number	1	2	4	1	1	1	1	1	1	1
Cinder Carryover, Percent of Coal Fired										
Leaving boiler	3.29	3.43	4.00	3.40	2.16	2.39	1.65	1.66	1.59	2.02
Retained in dust collector	2.77	2.92	3.08	2.83	1.88	2.10	1.47	1.47	1.39	1.58
Emitted from stack	0.52	0.51	0.92	0.57	0.28	0.29	0.18	0.19	0.20	0.44
Unburned Carbon Losses, Percent of Total Heat Input										
Ash pit refuse	0.34	0.46	0.36	0.40	0.52	0.51	0.93	0.93	0.45	0.48
Retained in dust collector	1.02	1.20	1.19	1.01	0.58	0.68	0.37	0.36	0.35	0.38
Emitted from stack	0.15	0.17	0.34	0.17	0.09	0.09	0.05	0.05	0.05	0.11
Total	1.51	1.83	1.89	1.58	1.19	1.28	1.35	1.34	0.85	0.97
Cinders Leaving Boiler (Calculated from cinder weights and sizing retained in dust collector and stack emission)										
Total leaving boiler, lb per hr	618.5	677.7	753.6	651.9	330.5	373.7	172.4	171.6	104.8	134.1
Size on 50 mesh	22.0	25.7	24.6	23.3	20.1	23.8	13.9	11.7	9.8	7.3
Size on 100 mesh	15.8	16.5	13.9	15.0	17.3	21.2	14.8	17.3	14.3	13.1
Size on 200 mesh	14.7	13.9	12.0	14.1	16.0	19.5	17.1	18.3	15.2	16.0
Size on 325 mesh	10.5	9.4	9.1	10.9	13.9	9.0	13.8	13.7	17.2	13.1
Size through 325 mesh	37.0	34.5	40.4	36.2	32.7	26.5	38.4	39.0	43.5	51.5

*Front overfire air off

Bricking up the windows on all three floors reduced the effect of the outside weather upon conditions inside the mill.

Humidity Problems Solved

. . . with insulated walls

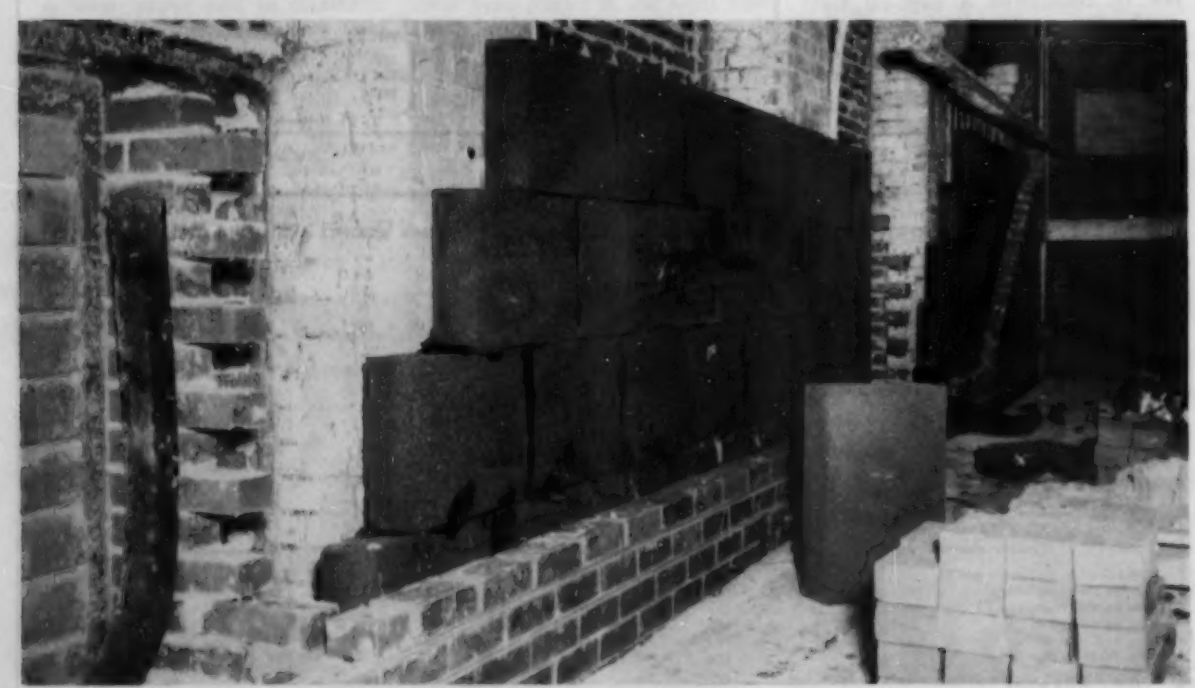
J. K. WAITS
Joanna Cotton Mill

I&P EXCLUSIVE

MANY INDUSTRIAL plants are faced with serious problems of humidity control. The requirements of some processes are such that an atmosphere with a high moisture content is required — as in the weave rooms of textile plants or in woodworking plants.

Joanna Mills, Joanna, S. C., found this a serious problem in one of their weave rooms. The warp yarns, which run lengthwise of the cloth, must be coated with a size mixture so that they will stand up to the chaffing encountered in the weaving of the cloth. This size mixture, consisting chiefly of starch, forms a pliable protective coating in an atmosphere of high relative humidity. At lower humidities, the starch film becomes brittle and cracks, thus providing little protection for the yarn. On the other hand, if the humidity is too high the starch becomes gummy and sticky.

The maintenance of the proper humidity in the weave room is therefore of vital importance for a low production cost and high quality cloth. Joanna Mills is the world's largest manufacturer of shade cloth, and they must have full control of the manufacturing process if they



After bricking up the windows, the weave room walls were further insulated with Foamglas followed by a course of brick.

are to maintain their leadership.

In the one particular weave room at Joanna, when the humidity controls were set to maintain a 90 percent relative humidity in the center of the room, it was impossible to avoid wall sweating and condensation on the machinery near the outside walls. This condition was particularly bad on the west wall. On cold days, slippery floors caused by excessive condensation created a hazard for personnel.

Humidity Problem

The constant moisture forming on the machinery also created a serious maintenance problem. The floor in this weave room is built up by using a 4-in. sub-floor, a 1-in. sub-floor, and a top floor of 1-in. maple. In spite of this construction, the floor rotted out at such a rate that it had to be replaced, at considerable expense, every two years.

The outside walls of the mill were of brick construction with large windows spaced every few feet. The weave room is on the bottom floor, the card room is on the second floor, and the spinning room occupies the top floor. To solve the serious condensation problem in the weave room, it was decided to reconstruct the outside walls to make them resistant to heat loss or gain. This room is 370 feet long by 153 feet.

Windows Eliminated

Humidity control also is very important in the spinning and card rooms. Since a much lower relative humidity is used in these rooms, the condensation encountered in the weave room was not present, but the large area of glass exposed to the outer elements made it very difficult to maintain a constant humidity. Consequently, the windows on all three floors were bricked up, using a course of 4-in. brick on the outside and 12-in. clay tile set inside the brick to fill the window space to the full thickness of the wall.

A layer of 4-in. Foamglas was then laid inside all exterior walls of the weave room and this was covered with a 4-in. course of brick.

The entire job, including materials and labor for bricking up all windows on the three floors and insulating the outside walls of the weave room, was done by Daniel Construction Company, Greenville, S. C., at a cost of approximately $80,000. Lockwood Greene Engineers, Inc., Spartanburg, S. C., did the design and engineering work.

Since this work has been completed, humidity control in all departments of this mill has been greatly improved. The effect of the outside weather upon the inside conditions is much less than in the past. All wall sweating in the weave room has been eliminated. There is less maintenance required because of the absence of corrosive condensate on the machinery, the accident hazard caused by the wet slippery floors has disappeared, and the useful life of the flooring has been considerably increased.

Since the completion of this job, a somewhat similar project has been completed for Lydia Cotton Mills, Clinton, S. C., and the insulation has worked equally well, eliminating all wall sweating. On the Lydia project, the insulating block was installed on the outside of the existing masonry rather than on the inside. It was covered with a course of 4-in. face brick. Hill & Hill, Welford, S. C., were the consulting engineers.

. . . with insulated ceiling

MANY INDUSTRIES can benefit by using thermal insulation to eliminate condensation in areas of high relative humidity. An insulated ceiling was recently specified by architect J. A. Fletcher, Vineland, N. J., to provide close control of humidity conditions in a potato warehouse operated by South Jersey Produce Co-operative Association, Inc., East Vineland, N. J.

Curing and storing a perishable commodity like sweet potatoes can lead to considerable grief if the building temperature and humidity are not closely controlled. After a preliminary curing stage, sweet potatoes must be stored at 60 F and 75 to 80 percent relative humidity. If insulation is not used, the ceiling drops below the dewpoint of the inside atmosphere during cold weather and condensation from the ceiling drips onto the potatoes.

To make certain these problems would not arise, Mr. Fletcher specified 4 inches of Foamglas to insulate the entire 7500 sq ft of roof slab over the storage area. Besides eliminating condensation on the ceiling, the Foamglas insulates against solar heat which tends to overheat the storage area on bright winter days. This is important, since any overheating must be counteracted by bringing in cold outside air which badly upsets the inside humidity conditions.

Oil-fired, warm-air space heaters, equipped with humidifiers and controlled by room thermostats, are used to heat the warehouse. Make-up air can be brought in from outside with the humid inside air vented to the atmosphere, or the heaters can operate on 100 percent recirculated air. Water headers on both walls can be used to provide emergency humidification by running water directly onto the floor.

New plant of the Brown-Lipe-Chapin Division of General Motors Corporation is located northeast of Syracuse, New York.

LP Means Loss Protection

PAUL E. PEACOCK, JR., President*
Peacock Corporation, Westfield, New Jersey

LP EXCLUSIVE

THE BROWN-LIPE-CHAPIN Division of General Motors Corporation erected its new Town Line Road plant on a 119 acre site in the rapidly expanding Industrial Park section northeast of Syracuse, New York. This convenient location is on the main road to the Syracuse Airport, where several air lines offer over 40 flights daily to all sections of the country, and also is adjacent to both the new New York East-West Thruway and the main line of the New York Central Railroad.

Built of brick and corrugated asbestos on steel framing, the plant contains nearly a half-million square feet of manufacturing area, which is divided into 40 x 60 ft bays with 18 ft high columns for roof support. Longitudinal monitors above these areas provide for circulation of air, dissipation of heat, and natural illumination, while case-hardened concrete floors facilitate in-plant traffic. Air conditioned offices, modern cafeterias, and parking space for over 1000 cars contribute to employee comfort and convenience.

Almost all of this plant's production is decorative chrome plated and die-cast parts such as hood ornaments, insignia, radiator grilles, cowl trim, bumper guards, hub caps, and other components of GM automobiles. During 1953, a total of 1,470,000 separate items were produced for Chevrolets alone, plus many parts for other cars in the GM line.

Process Demands for Fuel

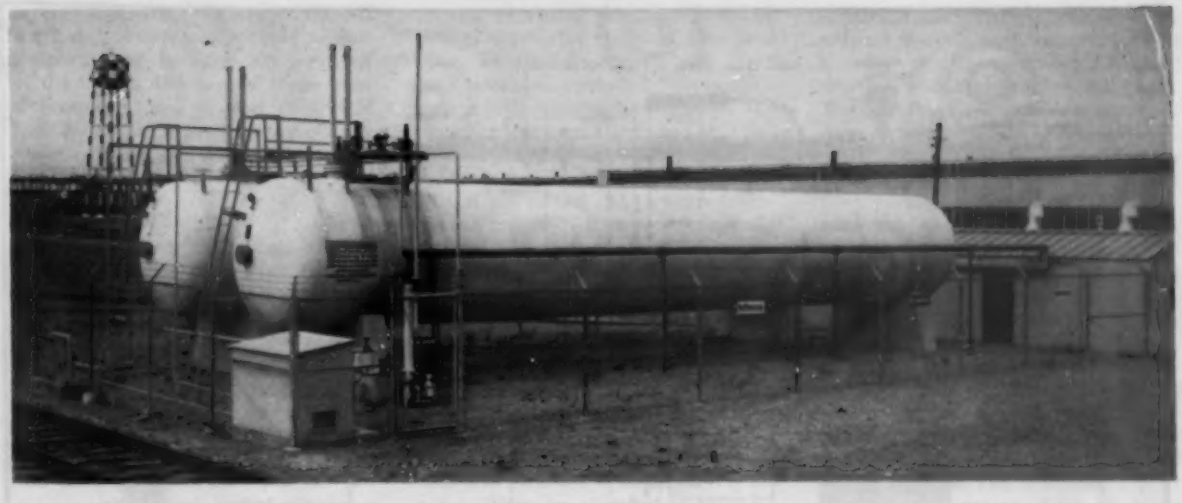
Production of this type requires numerous direct-fired facilities for the many exacting heating requirements from melting of the base metal through the various steps in processing the parts. At this modern plant natural gas is the logical fuel, but the large demand necessitated purchase of the gas on industrial interruptible rate service and installation of a standby plant for use during any period of natural gas curtailment. Brown-Lipe-Chapin engineers, after conferences with engineers of the natural gas company serving them, selected a propane-air gas plant as offering the best in standby protection.

Many factors were considered before arriving at this decision. At times the natural gas may be curtailed on a percentage basis rather than a 100-percent curtailment, and during such periods propane-air gas can be mixed with the natural gas in the same mains and burned in the same equipment. When the natural gas is curtailed 100 percent, the propane-air gas can replace the natural gas completely with little or no adjustment in burner settings. The changeover is rapid because a properly designed propane-air gas plant is relatively easy to start and operates automatically when in service. Furthermore, propane-air gas provides the same level of cleanliness and purity as natural gas.

Standby Plant

An exterior photo shows the general arrangement of the standby plant. Each of the liquid propane storage tanks is 9-ft in diameter by 67-ft long, and combined the two

*Editors note: The author is a nationally recognized authority in the LP gas and anhydrous ammonia plant engineering field. Since 1930 he has designed or installed almost 100 peak load and standby plants for gas utilities and industrial firms, including several installations in foreign countries. He has had numerous articles published in leading magazines, his previous contributions to INDUSTRY AND POWER including: "LP Gas is the Answer to Standby Fuel Problems at Industrial Plants," May 1951; "LP Gas Serves Industry," August 1951; "Meeting Gas Curtailment With Propane," April 1952; and "Advantages of Interruptible Rate Natural Gas Service," October 1952. Details of an anhydrous ammonia plant are given in his article "Savings by the Tank Car," Dec. 1953.



View of standby plant shows the storage tanks, equipment building (background), and enclosure for unloading compressor.

hold, in Btu, the equivalent of approximately five million cubic feet of natural gas. The prefabricated metal building at the far end of the tanks is the equipment center, the space being divided into three separate sections. One end section contains the natural gas regulators, meters, and related equipment, while the opposite end section serves as an electrical control room. Compact propane-air gas mixing equipment is installed in the center section —a room approximately 8 ft x 12 ft. The small enclosure in the foreground near the railroad siding houses an LP gas vapor compressor for unloading propane from tank cars. A steam heated propane liquid vaporizer is mounted next to the concrete support below a first stage vapor regulator station on top of the near storage tank.

Propane liquid is received in 10,000-gal tank cars and unloaded from the cars' dome connections, which have internal dip tubes extending to the bottom of the tank. The small unloading compressor transfers propane vapor from the storage tank to the tank car through another dome connection, thus developing a pressure differential of about 10 to 25 psi and forcing liquid through the eduction tube to the storage tank. This operation takes about 3 to 4 hours. After all of the liquid is transferred, the liquid valves are closed and the operation of the unloading compressor is reversed to reclaim the vapor in the tank car and return it to the storage tanks.

Propane-Air Mixing Plant

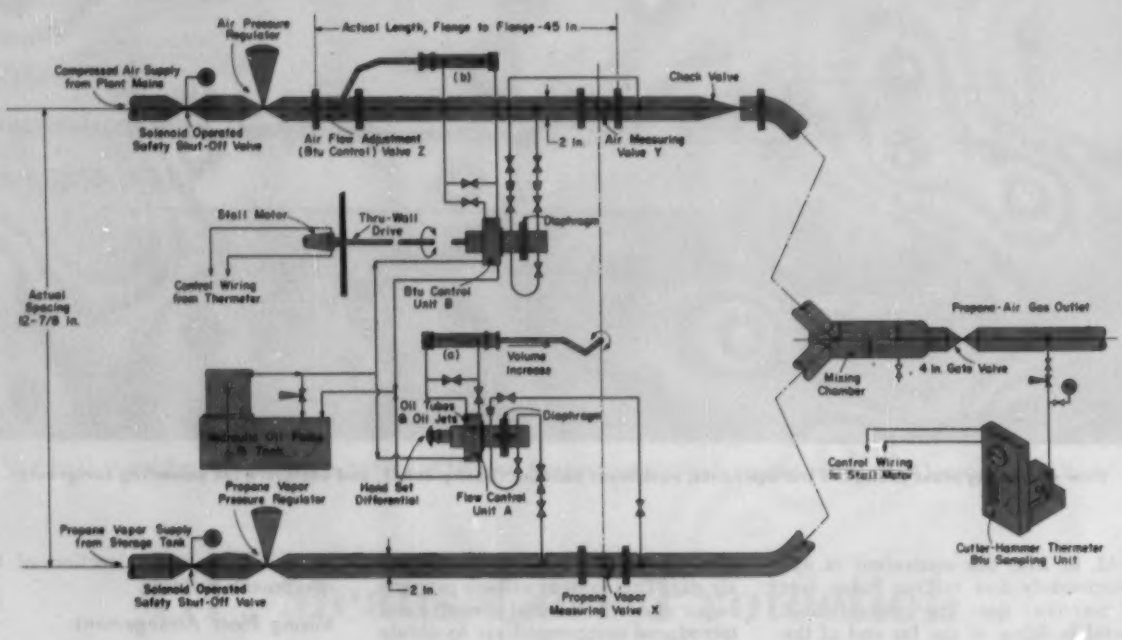
A Cutler-Hammer volumetric proportioning and Btu control system is installed to mix the propane-air gas. This system utilizes propane vapor under its natural pressure and introduces compressed air to obtain the desired mixed gas quality and pressure. At this installation the plant's high pressure air supply mains satisfy the mixing system demands, thus eliminating the need for a special compressor.

Principal components of the system include: a flow control unit, a Btu control unit with stall motor drive actuated by a Cutler-Hammer Thermeter Btu sampling instrument, air and propane vapor measuring valves, an air flow adjustment (Btu control) valve, compressed air and propane vapor inlet pressure regulators, and safety devices. The Thermeter and stall motor are installed in the electrical control room, and the balance of the facilities are located in the center section of the equipment building.

Mixing Plant Arrangement

Photographs provide ample evidence of the compactness of the system. The flow and Btu control units are side by side upon a table. Under this table are the small oil pump and tank used to operate the hydraulic pistons that control the various valve adjustments. A panel on the wall in the background, assembled as a unit by Cutler-Hammer, contains the air and propane vapor measuring valves, the Btu control valve in the air line, and the necessary interconnecting piping and accessories. Both the air line and the propane vapor line are 2-in. diameter, and these lines are spaced only 12⅞-in. apart center to center. Over-all length of the arrangement

Standby propane-air gas plants assure continuous operation of direct-fired facilities such as this melting furnace if natural gas service is curtailed.



OPERATION OF THE PROPANE-AIR GAS MIXING SYSTEM

Volume control. Assume the inlet pressure regulator is set to maintain 25 psig in the propane vapor line, and the direct-fired gas equipment is operating on a mixture of propane-air and natural gas with the natural gas flow controlled at the meter to a set amount (as with partial curtailment). If the plant demand for gas increases, the pressure in the pipeline at the control tap at the outlet of valve (X) decreases.

Since the pressure coming from the propane regulator remains unchanged, this reduction causes an increase in the differential pressure across valve (X). The change in differential throws the pressure diaphragm in flow control unit (A) out of balance from the set differential desired and moves the hydraulic flow control within the unit to a position that will adjust hydraulic piston (a) to open propane measuring valve (X) and restore the original differential in pressure. Air measuring valve (Y) is directly connected to the same linkage, and consequently it is also opened a corresponding amount so that the proportion of air and propane vapor is still relatively the same. As the demand for mixed propane-air gas increases or decreases, the two measuring valves (X) and (Y) are constantly positioned to meet the new condition.

Btu control. The Btu control unit operates air flow valve (Z), increasing or decreasing the differential pressure across the air measuring valve (Y). This changes the proportion of air to propane vapor and, therefore, the Btu of the mixed gas. Between changes in the setting of the Btu control unit (B), valve (Z) opens and closes with air measuring valve (Y) to meet the changing volume demand, the action being controlled by the differential setting across valve (Y) in the same manner as the volume or flow control is handled by the flow control unit (A) across propane valve (X).

Assume that for any reason the Btu of the propane-air gas has increased. This increase is reflected in the Thermeter Btu sampling instrument, and the indicator hand moves to a higher Btu setting than that of the control point. As the recorder hand moves, an electric contact on the "high" Btu side energizes a time control, which sends a short electric supply to the stall motor, rotating it in the proper direction to make a change in the differential setting of Btu control unit (B). The new differential setting throws the pressure diaphragm inside of the Btu control unit out of balance and causes piston (b) to move slightly and in turn reposition the air flow adjustment valve (Z).

Movement of air flow valve (Z) is to the open position to allow more air to pass to air measuring valve (Y) and increase the differential to the new higher setting. This then places the set differential and the actual differential in balance and air flow valve (Z) remains in proper set position. The amount of air passing air measuring valve (Y) is increased because of the increase in differential, and when mixed with the original amount of propane decreases the Btu of the gas. After the new sample of mixed gas is analyzed by the Thermeter, the recorder hand again registers the normal or desired Btu equivalent of the natural gas supply.

is only 45 inches from the inlet of the Btu control valve to the outlets of the measuring valves.

Mixing Plant Operation

The simplified schematic drawing of the mixing system provides detailed information on the operation of both the flow and Btu control units. Volumetric proportioning changes occur almost instantaneously and assure uniform pressure in the propane-air gas main at all times. However, because of the time delay in taking and analyzing a gas sample, the Thermeter makes Btu changes very slowly and at intervals to prevent an overadjustment which would cause hunting of the unit.

Some plants have attempted to use flow control equipment without the Btu control unit, and several of them have experienced considerable trouble in maintaining a satisfactory Btu of the mixed gas. Such difficulties may have been caused by changing pressure or temperature in either the propane vapor or air supply lines, or by the fact that it is practically impossible to get two dif-

ferent measuring valves machined accurately enough to provide perfect proportioning through all positions of the valves. Because of these conditions, this type of flow control is not generally recommended for standby plant service unless accompanied by Btu control.

Safety Provisions

Various safety and alarm devices can be provided with this type of mixing system. In the event of a partial or a complete failure of the propane vapor supply, the flow control unit itself automatically regulates the air and propane for whatever propane is available. The measuring valves and the flow adjustment valve, however, cannot be considered as complete safety shutoff valves, and other means must be provided for both the air and propane lines.

One common safety measure is the use of pressure switches in the air line and also in the propane vapor line. These switches are connected in series electrically with solenoid operated, hand reset, shutoff valves in both the air and propane lines. If the pressure falls to a predetermined setting in either line, the pressure switch connected to that line will open an electric circuit and close both solenoid operated valves. The valves will remain closed until the operator restores them to the open position and restarts the plant.

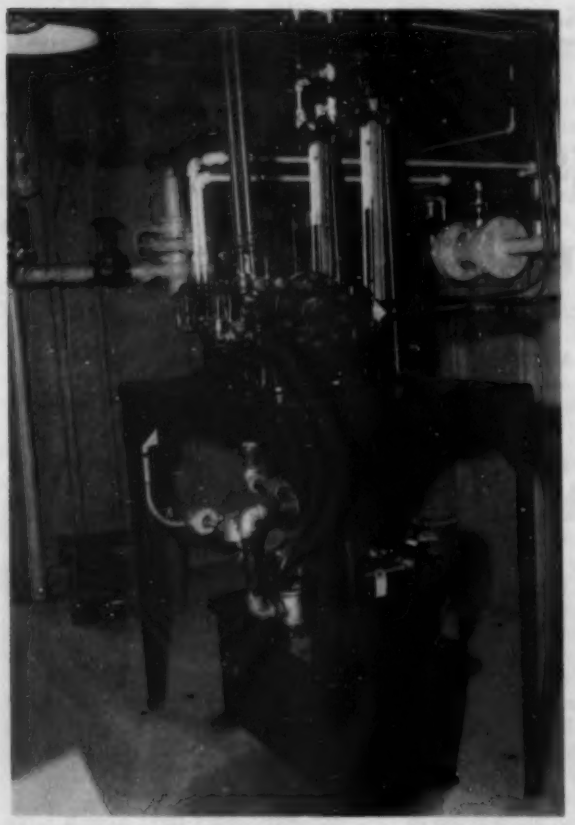
Since the Thermeter adjusts the Btu of the mixed gas to a predetermined average, it is not generally desirable to shut down the plant on Btu changes from the set standard. However, high Btu and low Btu contacts can be obtained with the sampling unit and arranged to sound an audible alarm if the Btu value deviates too far from the standard without being adjusted by the mixing system mechanisms. The Thermeter also can be furnished with limits that will stop Btu changes at a given point. This, in connection with an alarm, should be sufficient for safe operation if the measuring flame goes out or the instrument fails to function properly.

Test Schedules

Operators at Brown-Lipe-Chapin feel the propane-air gas mixing equipment is extremely convenient. Although no serious curtailment of natural gas has been experienced, a schedule has been set up for regular starting and stopping of the plant. The system is allowed to operate an hour or so and the changeover to propane-air gas is made just as though the natural gas supply had been curtailed. This provides assurance that the propane-air plant always is maintained in top mechanical order and is ready for instant service if curtailment occurs.

Every gas utility furnishing natural gas on interruptible rate service points out the possible effects of curtailment, and some even refuse to supply gas unless the industrial consumer installs and maintains a proper standby plant. In many instances the production losses during a prolonged shutdown would exceed the cost of the standby system.

Appreciation is expressed to the management and personnel of the Brown-Lipe-Chapin Division of General Motors Corporation for their fine cooperation in supplying data and photos during the preparation of this article.



Facilities for mixing the propane-air gas are compact; provide both volumetric proportioning and Btu control.

Cutler-Hammer Thermeter Btu sampling instrument and stall motor (left) are in the electrical control room.

General Electric

Luminous ceiling being installed in a large industrial area. The plastic diffusing panels, hung below such obstructions as structural beams, pipes, and sprinklers, can be lifted out of the supporting rails for access to equipment above.

Luminous Ceilings For Industrial Areas

I&P EXCLUSIVE

W. W. AYRE

ALTHOUGH MANY industrial areas need more light, increasing the level of illumination often produces objectionable glare and shadows when individual lighting fixtures are used. To overcome this disadvantage, luminous ceilings have been developed to provide a means of obtaining high levels of completely diffused light.

Every square inch of a luminous ceiling is a source of light of low brightness, thus holding to a minimum the specular reflection caused by glossy surfaces picking up the images of highly concentrated light sources. The diffusion of light in a luminous ceiling installation can be compared to the diffusion of daylight on an overcast day — and with similar shadow-free results.

A survey of luminous ceiling installations indicates a much wider acceptance of this type of lighting in offices and reception rooms than in industrial production areas. This is not surprising, for workers in offices demand good quality lighting, and in most instances the space is more readily available for a speedy change-over from the existing lighting system. But this does not detract from the need for good quality lighting which is even more acute in areas where expensive machinery is involved and where inadequate lighting may result in costly breakdowns, spoilage, or in serious accidents to workers.

A luminous ceiling can be considered as a lighting fixture as big as the area it serves. It consists of continuous rows of fluorescent lamps mounted above plastic diffusing panels which are hung from wall to wall on a pre-formed metal framework of aluminum or lightweight bonderized steel. The lamps are not visible to those in the room.

Advantages

By introducing light over a large area, the brightness of the system can be made relatively low — an im-

portant factor contributing to visual comfort — and yet illumination at the work level can be 100 foot-candles or more without glare. In addition, each point of work below is lighted from many directions — an excellent feature for industrial operations.

Luminous ceilings also provide an efficient means of controlling brightness ratios by bringing the light ratio between the light source, room surfaces, and the visual task within the preferred 3 to 1 ratio. This demands that the brightest surface — the light source — should not be more than three times as bright as the working area, and the working area should not be more than three times as bright as the darkest surface in the room. Changing requirements for light in the work space below also can be easily met by increasing or decreasing the number of lamps above the diffusing panel or by changing the arrangement of the lamps.

General Electric

View of completed luminous ceiling in the industrial area, shown on Page 68, demonstrates the evenness of light provided by the plastic diffusing panels.

Construction Features

Vinyl, acrylic, and polystyrene plastics are used in luminous ceilings. One plastic, Plexiglas, comes in sheets of transparent, corrugated panels in a wide range of sizes and thicknesses. Another plastic, used by Luminous Ceilings Inc., is described as a "corrugated, translucent, copolymer vinyl compound . . . " The plastic is treated to prevent static dust attraction. It weighs approximately 0.5 ounce per square foot and is 0.007 inch thick.

Structural Load

The structural load for luminous ceilings is relatively low, being about 1½ pounds per square foot for most installations. Critical fixture heights occasioned by high machines do not offer real problems because the flexible construction features of luminous ceilings permit the intrusion of such units without materially affecting the over-all efficiency of the installation.

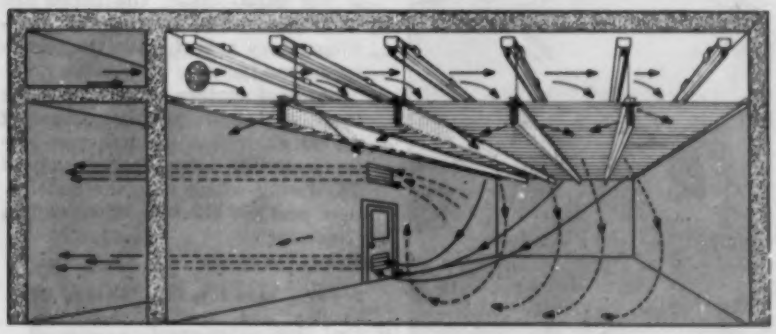
Conditioning of the cavity between the plastic and the true ceiling is very important and any existing pipes or ducts should be painted white to provide a reflectance of 80 percent. Bare fluorescent lamps without reflectors are then installed with their channels flush with the ceiling, or suspended by hangers.

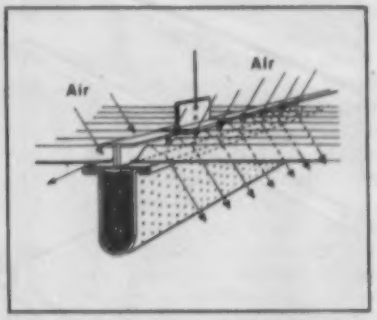
The distance between rows of lamps is determined by selecting the level of illumination desired at working level and then applying the Lumen method for general lighting design *(Illuminating Engineering Handbook)*. Coefficients of utilization for bare lamps are used, adjusting for total light transmission of the plastic diffuser and the plenum.

Maintenance

Properly designed luminous ceilings have proved to be easy to maintain. Dust collects mostly on the bottom of the plastic, and most of the maintenance consists of removing dust and replacing lamps. The panels can be lifted from their supporting frames for washing. Luminous Ceiling Inc., has devised a special washing machine for its plastic panels and offers "mechanical washing service at a cost not to exceed 3¢ per square foot, which will scrub, rinse, and destaticize the plastic."

Among the early professional re-





Luminous Ceilings

Air conditioning ducts can be eliminated by using the plenum above the luminous ceiling panels for air supply. A ⅛-in. clearance between the plastic and the supporting rails (right) provides low velocity distribution of the air.

Rohm & Haas

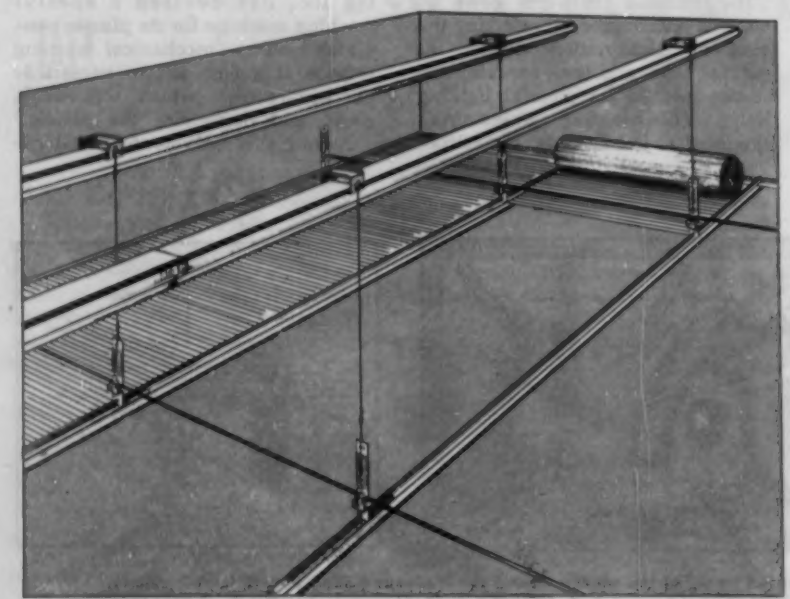
Diffused light from this luminous ceiling, installed in the control room of one of Philadelphia Electric Company's power stations, reduces the amount of reflection from the instrument faces—yet provides a high level of illumination.

ports on luminous ceilings is one in *Illuminating Engineering*, January, 1951. It covered a trial installation of luminous ceiling lighting set up in a milling machine room at Brown University "to produce a luminous environment which would give optimum visual conditions for any position of the worker."

The ceiling installation consisted of thin, flexible corrugated strips of plastic about three feet wide, running entirely across the room. The upper part of the room was obstructed by pipes. These were painted glossy white. Slimline lamps, with a maximum spacing of 29 inches, were placed below the principal obstructions and 27.5 inches above the plastic panels.

Measurements covering a three month period showed the illumination after 91 days to be 96 percent of the initial value. The lamps had burned about 200 hours during the preparatory period while the installation and painting were being done.

Study of another installation made over an eight months operating period showed a maintenance factor including lamp depreciation of .78, during which time the installation was not cleaned. This ceiling



Sylvania

Drawing shows typical method of hanging and spacing supporting rails. This system uses continuous lengths of flexible, corrugated plastic.

was in a building adjoining production facilities releasing "an average amount of industrial dirt."

Fire Protection

The plastics employed in luminous ceilings do not invalidate existing sprinkler systems. Tests of one type of diffusing plastic made at Underwriters' Laboratory indicate that the material softens at 140 F. Upon softening, it loses its corrugations and falls out of its hangers. The sprinklers went into action at 165 F.

The Underwriters' Laboratories, Inc. Research Bulletin No. 22, prepared for the National Board of Fire Underwriters, classifies a corrugated vinylite plastic sheeting 32 inches by 32 inches and approximately 0.009-inch thick as "self extinguishing." The plastic melts when subjected to a direct flame, but does not propagate the flame after removal of the external fire. Conclusions reached were that in the event of fire, the plastic can be expected to soften and drop from supporting rails at relatively low temperatures—about 145 F, or would be brought down by a sprinkler discharge at 165 F.

Tests made at Boston by Factory Mutual Laboratories showed that luminous ceilings do not appreciably delay action of the sprinkler heads above the plastic. The tests were made using wood and excelsior equivalent to 60,000 Btu per minute which would, in the absence of a luminous ceiling, open 160 degree automatic sprinklers of average sensitivity in about 7 to 8 minutes. The actual time with a completely luminous ceiling below the sprinklers was 8 minutes, 10 seconds.

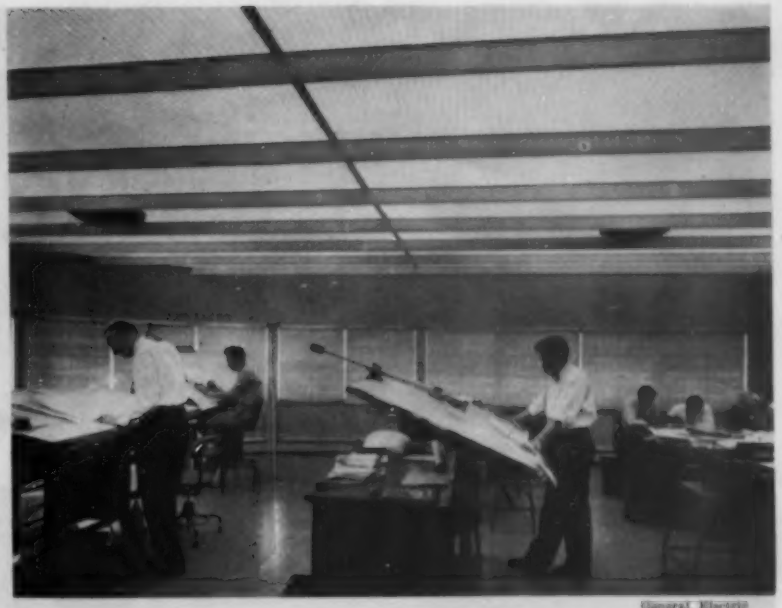
Cost

Mr. R. L. Oetting of General Electric Company's Lamp Division puts the basic costs of luminous ceilings within a range of $2.00 to $8.00 per square foot. He states: "The prices vary with the complexity of the system and the features incorporated."

Operating and installation cost comparisons depend on the type of lighting to which the luminous ceilings are being compared. Luminous ceilings are generally figured at 50 foot-candles and up, while conventional systems rarely attain these high intensities.

Air Supply and Acoustics

The plenum or cavity between the plastic and the ceiling can be used as an excellent supply source for conditioned air. In some installations, an average space of ⅛ inch is left between the plastic and the hanging track through which air may be circulated. This method provides extremely low velocity distribution of conditioned air.



General Electric

Sound-absorbing baffles extended below the plastic ceiling provide acoustical control. Cross baffles can be used to further reduce the noise level.

Acoustical baffles can be hung by means of wires or rods to control sound. In the Acusti-Luminous ceiling, Luminous Ceilings Inc. uses hollow fins made of perforated steel and containing a sound absorbing pad. They are hung at intervals below the plastic ceiling. In the Sigma-Plex system, manufactured by the Wakefield Brass Company, projecting perforated metal wedges are used. These channels are used on either 4- or 5-ft centers.

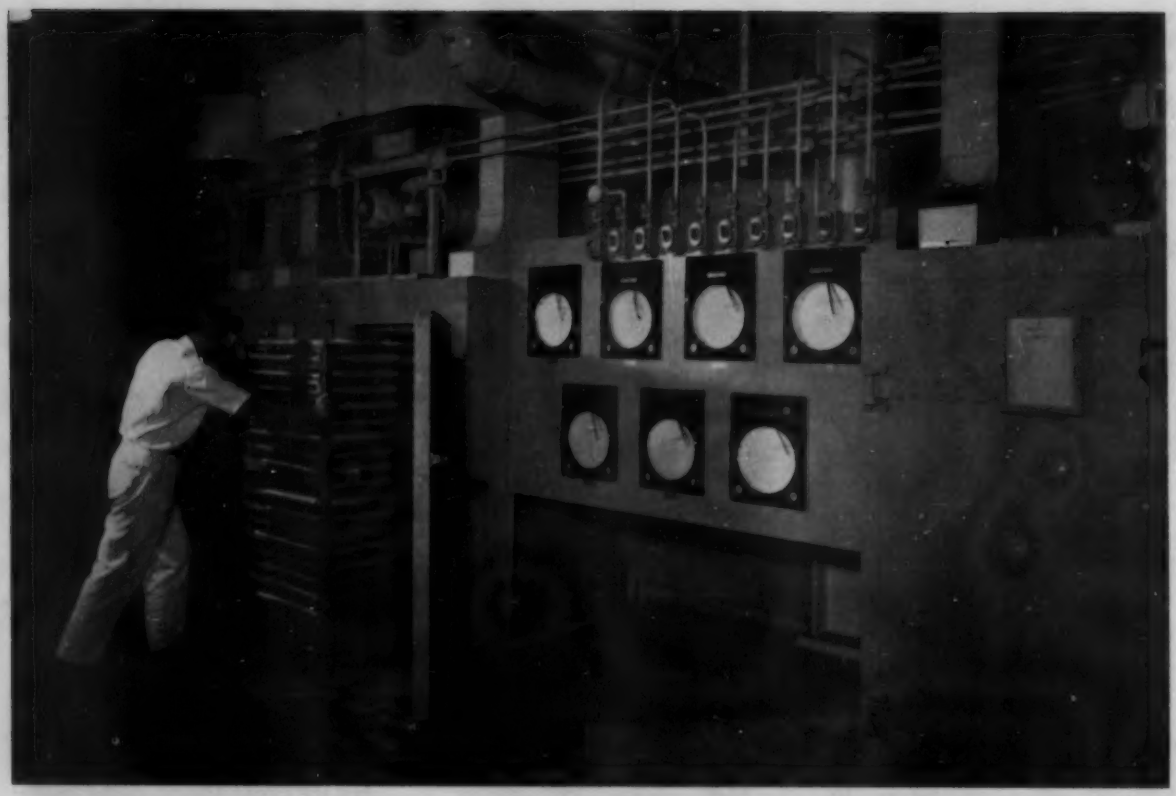
Utilities Pass 100-Million kw Mark During Light's Diamond Jubilee

OCTOBER 21, 1954 marked the 75th anniversary of Edison's invention of the first practical incandescent lamp. Since then, 39½ billion electric lamps have been produced in this country, and as many more will be made in the next 15 years. The product of Edison's inventive mind is a $25 billion electric utility industry in this county—an industry that has doubled its generating capacity every 10 years.

Even Edison himself did not envision the amazing progress that would develop from his inventions. At the time of Light's Golden Jubilee in 1929, he remarked, "I must confess that I never dreamed that from the incandescent lamp would come the stupendous electrical industry of today".

Particularly appropriate to the celebration of Light's Diamond Jubilee was the passing of the 100-million kilowatt mark for generating capacity installed in the United States. The new mark was set with the dedication, on October 21, of the fourth turbine-generating unit at Detroit Edison's new St. Clair Power Plant.

Among other dedications of new generating capacity taking place on October 21 was the first 132,000-kw unit of Pennsylvania Power & Light Company's new Martins Creek Plant.



Pneumatically-controlled recording thermometers measure and control the wet and dry bulb temperatures in cabinet driers.

Which Should It Be . . . . .

I&P EXCLUSIVE

Electric or Pneumatic Controls

Proper use of electric and pneumatic automatic controls assumes greater importance as the trend towards automation in industry continues to grow.

S. D. ROSS
Industrial Division (Philadelphia)
Minneapolis-Honeywell Regulator Company

AUTOMATIC CONTROL of processes and equipment poses many problems in the selection of proper instruments and other components which comprise the complete, integrated system. After the choice is made of variables to be controlled and of the best methods for measuring them, an important problem that remains is whether the system will be pneumatically or electrically operated.

Aside from technical considerations, several factors often dictate the use of one type of control system over the other: past practice in the plant, availability of desired equipment with one or the other type of control, and relative cost under given installation conditions.

In general, basic control systems (either electric or pneumatic) make use of the same instrumentation units or elements: (1) a measuring element such as a thermocouple or thermometer bulb for temperature; (2) the control instrument proper, which may be non-indicating, indicating, or recording, and which usually contains the control mechanism within its case; and (3) the final control element with a suitable power unit such as the electric motorized valve or diaphragm motor valve that is commonly installed. Such a system forms a closed loop with the process; for example, vari-

ations in oven temperature are measured by the instrument, then are compared with the desired value, and are converted into a control impulse through the control mechanism. This impulse positions the control valve in such a way as to cause the temperature to be maintained near the desired value.

Closed Loop Action

In other words, there is a closed loop of action and counteraction. The variable itself is used to create a signal that is compared to the desired value; the amount of error above or below the desired value determines the counteraction, which is amplified electrically or pneumatically to provide sufficient power to operate the control valve.

Simple two-position, three-position, or floating control in electronic control systems is obtained by actuation of electric contacts that regulate the power supply to a solenoid valve control or to the "open" and "close" windings of the valve motor. One type of electric controller employs a vane on the indicating pointer; the vane operates an electronic oscillator circuit when it passes between coils that are positioned by the set-point index of the instrument. The circuit actuates a control relay whose contacts pass power to the control motor or other load. Other types of contact controllers use mercury switches with a suitable actuating mechanism.

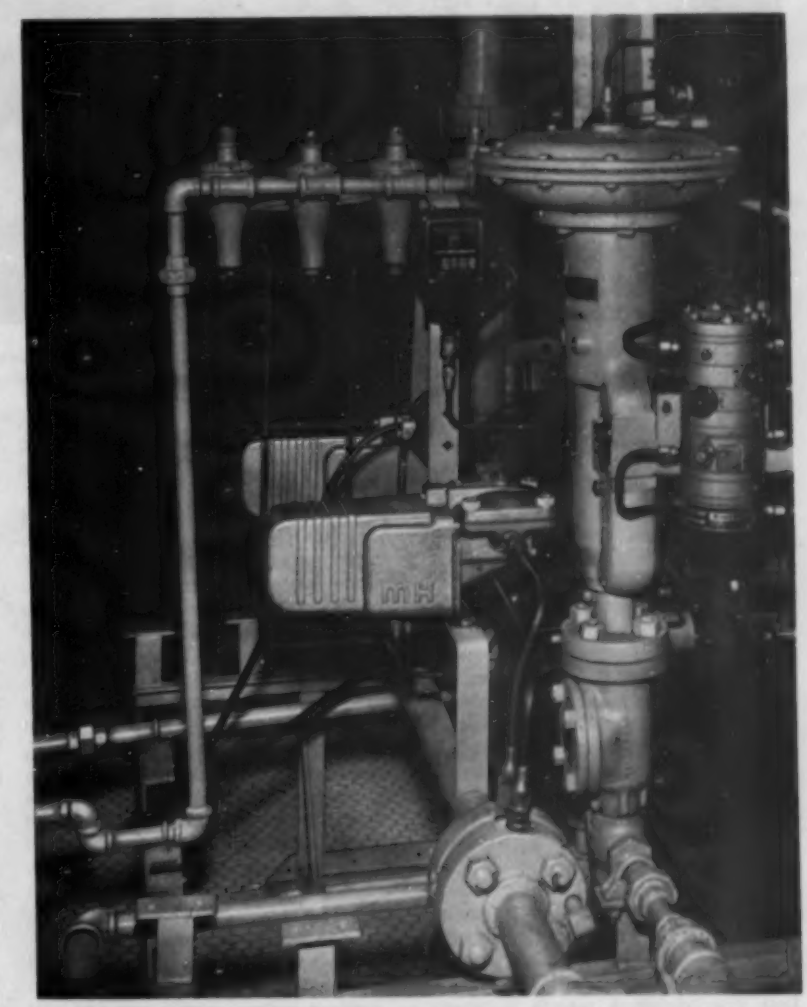
For more sophisticated modes of electric control — such as proportioning and proportioning-plus-reset — the control motor usually must incorporate a slide-wire with the slider actuated by the motor shaft driver. This slide-wire is connected electrically in a Wheatstone-bridge balancing circuit with a similar slide-wire in the instrument; the instrument slide-wire has a sliding contact actuated by the pen or pointer. Set-point adjustment and control adjustments for proportional-band or reset action are provided electrically in a compact unit which incorporates an electronic balancing circuit in its system.

In pneumatic control systems, the essential operating principle of one common method is based on a constant supply of clean compressed air being fed to a nozzle; a flapper over the nozzle throttles the air coming from the nozzle. The flapper is actuated by the instrument pen or pointer; a restriction in the air supply line permits air pressure to build up in the system as the flapper closes over the nozzle and to exhaust from the system as the flapper uncovers the nozzle. A booster pilot relay is usually added to the system to give it more capacity and faster response in the positioning of the final control element of the system.

In two-position pneumatic control, the system is designed so that a relatively small pen or pointer movement causes the flapper to completely open or close the nozzle opening, providing full air or no air pressure to the diaphragm motor valve. Proportional and other control modes are provided by adding ingenious bellows mechanisms which translate the minute flapper movement into gradual throttling action of the air-to-valve pressure changes. New types of pneumatic controllers employ stacked diaphragm chambers in a cylindrical unit to provide the different control responses to pressure variations.

Some 10 to 15 years ago, increased use of continuous processing at ever higher throughputs in the petroleum and allied chemical industries added new emphasis to the need for completely automatic controls. Because of the natural aversion of these industries to electrical equipment with its problem of explosion-hazards, they leaned strongly toward pneumatic control and are largely responsible for the impetus behind the rapid advances in pneumatic controller designs. Moreover, pneumatic control lent itself readily to wide-band throttling action, automatic reset, and continuously adjustable valve positions required in such continuous processes.

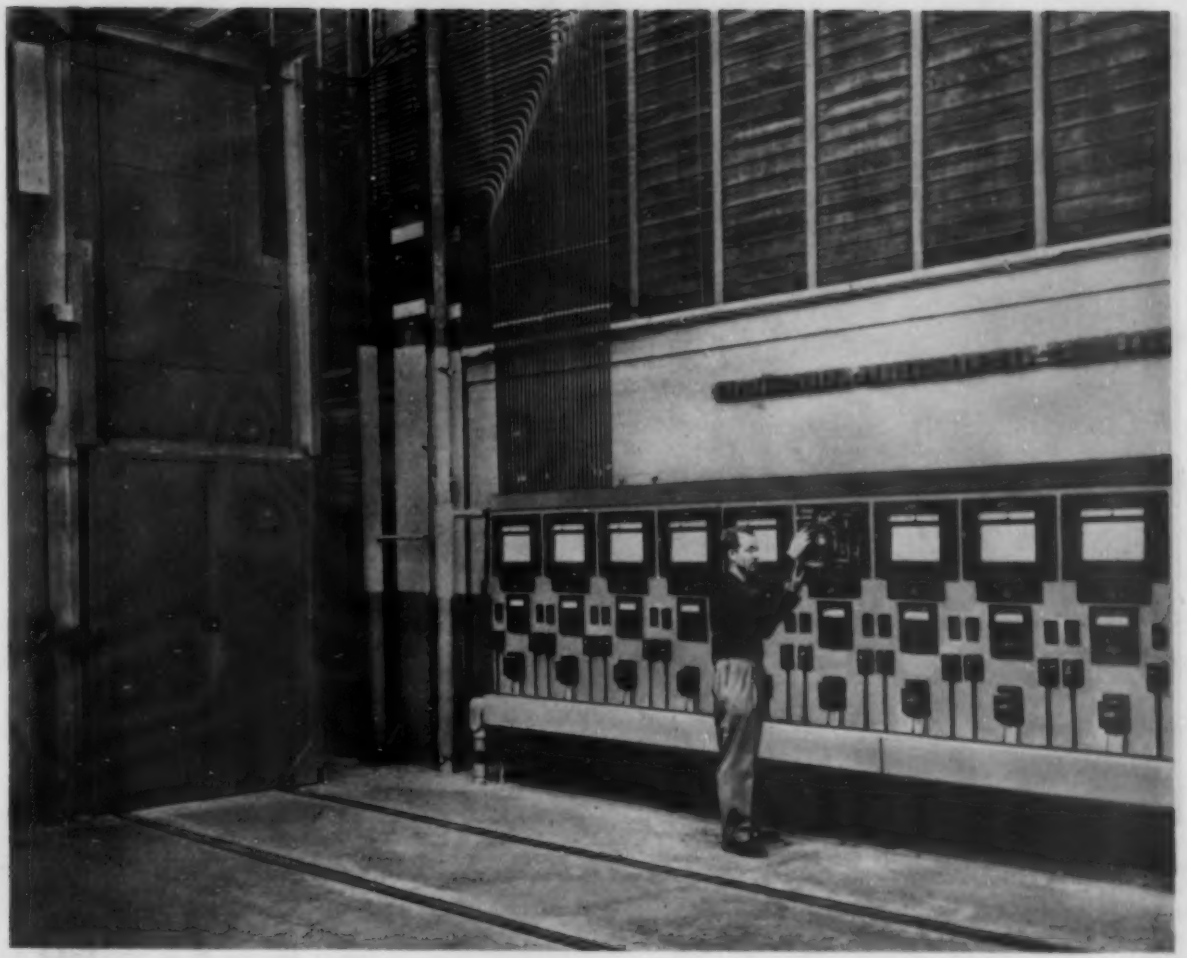
Yet in this same period, the iron and steel industry and much of the metal processing industry remained electrically minded to a large extent. Greater recognition of instru-



A pneumatic flow regulating system with all components close-coupled. At upper left are combination pressure regulators and air filters for air supply.

TABULAR COMPARISON OF AUTOMATIC CONTROL CHARACTERISTICS
PNEUMATIC VERSUS ELECTRIC

Item	Characteristic	Pneumatic Control System	Electric Control System
1.	Actuating medium.	Requires constant source of clean, dry air or other gas (compressor, filter, and pressure regulator).	Requires constant electrical supply at proper voltage.
2.	Effects of corrosive atmospheres.	Minor effects, tend to be self-purging in the instrument and is otherwise a closed system.	Requires tight instrument case and possibly air purging to prevent corrosion of slidewires, contacts (except mercury switches).
3.	Effects of explosive atmospheres.	No danger in pneumatic control system.	Instrument electrical components may not require explosion-proofing if located in a control house, but the valve control would require protection.
4.	Transmission lines (instrument to valve or other final control element).	Usually standard ⅜- or ¼-in. (O.D.) copper tubing. Requires air-tight fittings.	2- to 5-wire electrical cable. Relatively easy to install but must be protected against moisture and corrosive atmospheres.
5.	Effects of distance from instrument to valve or other final control element.	Limited because of lag introduced. Booster pilots in air-to-valve line can help overcome lag.	No lag introduced by longer transmission lines.
6.	Construction of power unit (for control valve or other final control element).	Simple in design and usually easy to maintain. Inherently explosion-proof.	Generally more complex in design and more difficult to maintain. May require explosion-proofing.
7.	Positioning ability of power unit.	Normally provides an infinite number of intermediate positions for throttling action. Diaphragm motor may require valve positioner. (Springless diaphragm and piston motors available with more power).	Generally provides finite number of positioning steps. Power available is constant. Speed of response limited by maximum speed of motor.
8.	Control modes available (two-position, proportional-plus-reset, rate action).	Available in all modes. Relatively simple in design, and easy to maintain, but requires familiarity with pneumatic annd mechanical design principles.	Available in all modes. Relatively complex in design. Requires careful maintenance by men familiar with electrical and sometimes electronic principles.



Three, 3-zone aluminum aging furnaces have separate electric zone controls through time proportioning, electronic relays.

mentation in general and recognition of the advantages to be gained by more sophisticated control modes led to developments of electric controllers incorporating features essentially comparable to the newer pneumatic controllers. Today, some traditionally "pneumatic-minded" industries are considering electric control, but the reverse is also true.

Certain Applications

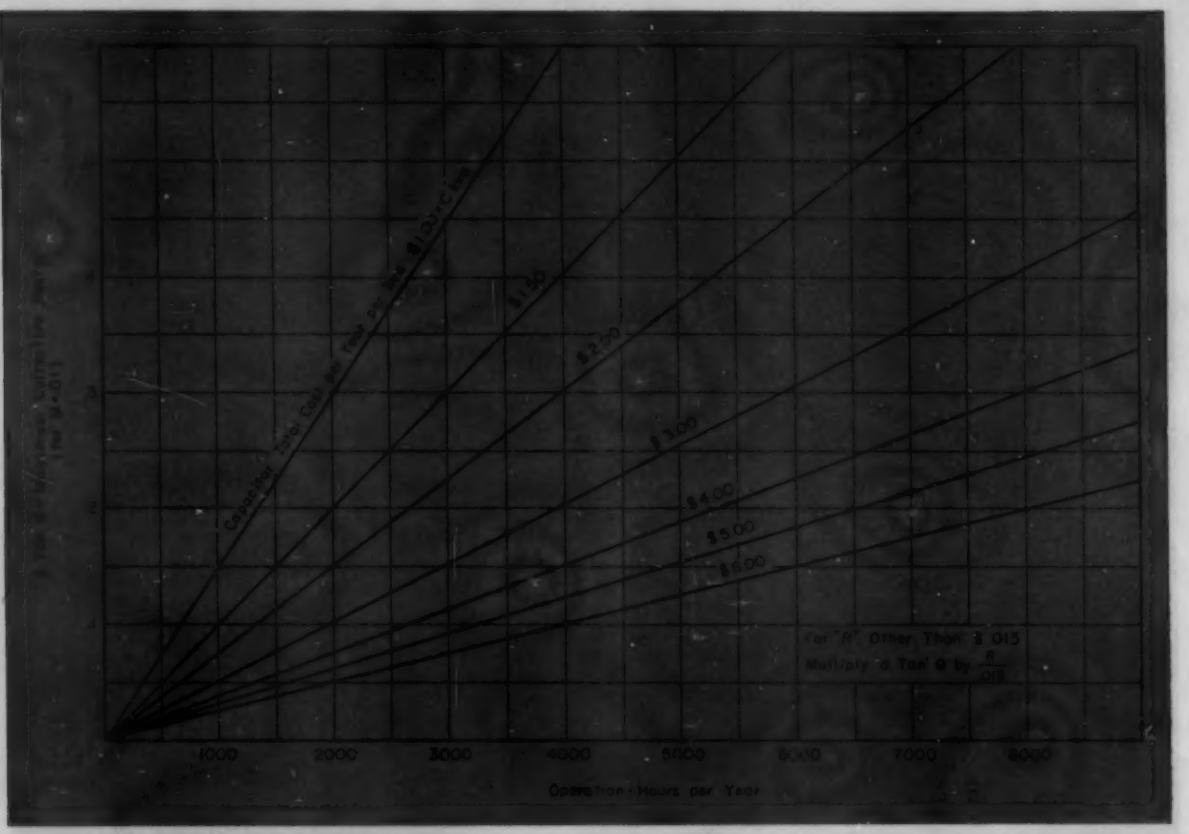
Certain applications for reasons that might involve a secondary condition peculiar to the process or plant, may demand the use of electric or pneumatic control. In gas fields or on gas pipelines, for example, no constant source of electric power may be available, but the presence of the gas itself under pressure supplies an ideal medium for operation of pneumatic controllers. On the other hand, control of the temperature of an electric furnace by contactors would normally point toward the use of an electric control system.

Also, it is significant that certain processes will require combination of electric and pneumatic control. Timed or sequenced operations can often be programmed better electrically, but it may be desirable to employ pneumatic control of the process variable. High-limit cut-off systems may be electric in combination with a pneumatic control system. (The converse is, however, not generally true.) For example, an electric-pneumatic relay can be energized from a high-limit switch in the instrument to exhaust air from the air-to-valve line and to shut off fuel. Such action would be difficult to arrange in a completely pneumatic system.

In the accompanying table, an attempt has been made to generalize on the relative advantages of electric and pneumatic control systems. Such generalizations should be considered only as starting points for serious evaluation of any given problem. Consultation with instrument specialists is mandatory for final selection of a control system.

Continuing Improvements

The wisdom of the user's continued review of latest developments in the fields of both electric and pneumatic control is to be emphasized. Instruments today incorporate many design improvements and newer operating principles unheard of even five years ago — the results of scientific advances in the fields of metallurgy, electronics, mechanical design, chemistry, and others. Specific achievements in these various fields can give temporary but significant advantages to particular models of either electric or pneumatic controllers. What is said today about their relative advantages almost certainly will not be true tomorrow.



By taking the operating hours for each of the major power blocks along the abscissa and selecting the point closest to the curve corresponding to the total capacitor cost per year per kva, the maximum corrective factors can be found.

The Economic Limits for Power Factor Corrections

I&P EXCLUSIVE

CHARLES N. DEBES
Charles N. Debes & Associates
Consulting Engineers

An original method by the author for calculating how much outlay for capacitive correction can be economically justified by the power bill savings.

POWER COMPANIES generally offer incentives to their industrial accounts for the improvement of plant power factor. The incentive usually takes the form of assigning a multiplier to be applied to the gross billing, with the multiplier varying as some function of the power factor.

A variety of charts and graphs have been published showing different methods of calculating how much capacitor correction is required to raise the plant power factor by a specific amount. In many instances, plant power factor has been corrected far beyond the point where it can be economically justified. As a result, too little attention has been given to how much capacitive correction is actually necessary in terms of dollars and cents savings.

The decision to correct power factor should be based on whether or not the addition of capacitors will effect a savings in the power bill equal or larger than the outlay for their installation, amortized over a given period of time. The amount of capacitive correction that can be economically justified is readily found with the aid of the accompanying table and graph, after taking into proper account such individual factors as system voltage and local utility practices, that must be

considered in each specific case.

An analysis of the load must also be made so as to fairly accurately forecast the trend of power consumption. The necessity for capacitors is very closely tied in with the number of hours a plant is in operation. Obviously, some experience is necessary in this analysis in order to properly forecast the number of hours a plant will be in operation over an extended period.

After the growth trend has been analyzed, the plant load can be broken down into the major blocks of power for specific periods of time. There will be broad base blocks of power that extend for most of the year. Then there are intermediate blocks of power that will be used for less and less time. Usually, three or four major power blocks are sufficient. Finally, peak loads that occur very seldom need not be considered from the standpoint of capacitor addition.

Practical Example

As a practical illustration, using fairly ideal conditions, assume that it is necessary to determine the economical point of capacitor addition for a plant with the following load blocks:

Power Black	*Annual Hrs.*	*Kw*
A	8,760	100
B	4,160	200
C	2,080	250
D	1,000	150

The plant is operating with a power factor of 70 percent (actually, it can vary a great deal from month to month, depending upon the various seasons, the conditions, and operations within the plant) at which point the multiplier (M), taken from Table I, is 1.00. How much capacitor correction can economically be added, and what will be the resultant power factor during the day shift (700 kw maximum and 550 kw average) and during the night shift (150 kw)?

Fundamental Relationship

In order to establish the fundamental relationship between the total installed cost of the capacitors and the net savings in the power bill, it is necessary to compute these two items. The total cost of the capacitors in place must include the cost of the capacitors, rack and structural mounting (where necessary), disconnect switch, conduit and wire, and associated circuit breaker or fuses to connect to the power source. These computations should be on the basis of one kva. The total capacitor cost per year per kva that is used in the graph is determined by adding the depreciation, maintenance costs, interest on investment, and the cost of power loss in the capacitors and cables.

Although the actual cost of capacitors per kva per year will vary considerably, depending upon the system voltage, the following average costs have been assumed:

Cost of complete unit per kva	$18.00
Circuit breaker per kva	3.50
Installation per kva	3.00
Total investment per kva	$24.50

The total cost per year is therefore:

Assume 10 year depreciation	$ 2.45
Interest on investment at 4 percent	.98
Annual maintenance and inspection at 2 percent	.49
Capacitor power loss at .33 percent, (29 kwh at 1.5 cents per kwh)	.44
Associated cable copper loss at .167 percent	.22
Total annual cost (dollars per kva per year)	$ 4.58

It should be noted that a ten year depreciation is a low value for capacitors, but tends to account for possible moving of equipment and the inability to forecast future loads accurately. Thus, if it is still economical to add capacitors with this higher penalty, it will be that much more likely to prove economical over a longer period of time.

From Table I, it can be seen that as the power factor is improved through the installation of capacitors, the corresponding value of the multiplier decreases. Therefore, the savings in the power bill is a direct function of the decrease in multiplier value made possible by an improved power factor.

The economical point for the addition of capacitors is reached when the savings (S) is equal to the cost of additional capacitors (C), or, when:

$$S = C$$

or:

$$R \times H \times M = C_{kva} \times \triangle \tan \theta$$

where:

- S = Savings in the power bill in dollars.
- C = Cost of additional capacitors in dollars.
- R = Energy rate in dollars per kwh.
- H = Hours of operation per year for each block of power being considered.*
- M = Increment of the multiplying factor (this factor usually varies in steps of .01, see typical rate schedule Table I).
- C_{kva} = Total cost of installed capacitors per kva per year.

In order to improve the multiplier (M) one step, a certain quantity of capacitor addition is required depending upon the existing power factor and the rate schedule. Since the amount of capacitance required is a function of the change in the value of the tangents of the phase angles, this required change can be expressed as $\triangle \tan \theta$. The $\triangle \tan \theta$ is thus the difference in the values of rkvah/kwh (reactive kilovolt-ampere-hours divided by kilowatt hours) when advancing from one multiplier to the next. These comput-

**Usually the electric bills are computed and submitted monthly. The yearly figure of load hours may be offset by different load conditions during different months of the year. A complete plant survey should allow for these monthly differences.*

TABLE 1 — TYPICAL POWER RATES

Multiplier	*Approximate Power Factor*	*Ratio (Reactive kvah) / (kwh) (tan θ)*	*Δ tan θ*
.90	.98	Less than .201	.112
.91	.955	.201 to .313	.128
.92	.916	.314 to .441	.098
.93	.88	.442 to .539	.085
.94	.848	.540 to .624	.078
.95	.82	.625 to .702	.073
.96	.79	.703 to .775	.068
.97	.765	.776 to .843	.063
.98	.74	.844 to .909	.059
.99	.72	.910 to .986	.058
1.00	.702	.969 to 1.026	—

ed values of $\triangle$ tan θ are also tabulated in Table I. Thus, the savings in the power bill (S) by raising the multiplier (M) by one step, or .01 for one kw load, can also be expressed as follows:

$S = R \times H \times M = R \times H \times 10^{-2}$ dollars per kw load.

The cost of capacitor addition necessary to correct one kw of load by a quantity $\triangle$tan θ can then be stated as:

$C = C_{kva} \times \triangle \tan \theta$

The variables of operation hours (H), maximum corrective factor ($\triangle$tan θ), and various total costs of installed capacitors per kva per year (C_{kva}) are shown in the accompanying graph. For rates (R) other than .015 per kwh, the $\triangle$tan θ can be multiplied by R/.015.

Corrective Factors

For each major power block, the maximum economical $\triangle$tan θ can be checked from the graph. Taking the operating hours for each of the power blocks along the abscissa, and the curve corresponding to the total capacitor cost per year per kva (C_{kva}) at $4.58, the maximum corrective factors ($\triangle$ tan θ) are read from the ordinate as: .295 for power block A; .140 for power block B; .075 for power block C; and .035 for power block D.

By checking these maximum values against the $\triangle$tan θ's given in Table I—for example, for power block A, the maximum $\triangle$tan θ was found to be .295, and since this exceeds the highest value in the sequence of $\triangle$tan θ given in Table I, namely .112 corresponding to a power factor of .98, it seems most economical to correct the power factor of block A to 98 percent—it appears economical to correct the four power blocks as follows: Block A to 98 percent power factor; block B to 98 percent power factor; block C to 82 percent power factor; and block D, no addition justified.

Economical Requirements

The economical capacitor requirements are then calculated by determining how far the multiplier can be increased in order to stay under the maximum tan θ value. For each power block, $\triangle$tan θ is the difference between the existing tan θ_1 and the desired new tan θ_2:

$\triangle \tan \theta = (\tan \theta_1 - \tan \theta_2)$.

The economical addition for each block of power can then be found by multiplying this value by the average kw load in the power block. Economical capacitor addition in kva = kw $(\tan \theta_1 - \tan \theta_2)$.

In the general case, it can be assumed that the average plant load can be broken down into four major blocks designated kw_a, kw_b, kw_c, and kw_d. Each block of power in turn extends over the following diminishing periods of hours, H_a, H_b, H_c, and H_d. As has already been shown, the maximum corrective $\triangle$tan θ for each of the four blocks of power can be determined from the graph. The tan θ_2 for each $\triangle$tan θ can then be found by using the power factor taken from Table I and expressing this power factor (by definition the cosine θ) as a function of the tangent. The latter values are assigned the designation tan θ_a, tan θ_b, tan θ_c, and tan θ_d. The total economical capacitor addition in kva may then be expressed as:

Additional kva =
$kw_a (\tan \theta_1 - \tan \theta_a)$
$+ kw_b (\tan \theta_1 - \tan \theta_b)$
$+ kw_c (\tan \theta_1 - \tan \theta_c)$
$+ kw_d (\tan \theta_1 - \tan \theta_d)$

Tan θ_1 for a power factor of 70 percent equals 1.026. (This value is obtained by looking up the angle—in a table of natural functions—whose cosine equals .70, then finding the tangent of this angle.) The tan θ values for each of the maximum corrective $\triangle$tan θ factors for the various power blocks are similarly found and tabulated below.

tan θ_a	.201
tan θ_b	.201
tan θ_c	.702
tan θ_d	none

Thus, by substituting in the above equation, the additional kva justified equals:

kva = 100(1.026 − .201) + 200 (1.026 − .201) + 250 (1.026 − .702) + 0
= 328.5 kva

The resultant average plant power factor during the 700 kw demand period (blocks A, B, C, and D) is computed as 87 percent. During the balance of the day shift, with a 550 kw demand (blocks A, B, and C), the power factor is 91.8 percent. Likewise, the resultant average plant power factor during the night shift (block D) is 99.8 percent leading.

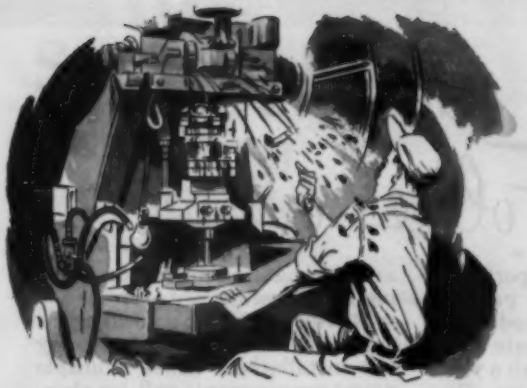
Expansion Joint Designed to Prevent Insulation Damage

Bellows-type expansion joints installed on heated air ducts at the St. Clair generating station of the Detroit Edison Company have bellows that are designed to close in more than five inches (the range being dependent upon the bellows dimensions) without placing any stress on the insulation or finish. By thus eliminating the possibility of expansion cracks, there is rarely any need for inspection or maintenance of the insulation. In addition, the joint is entirely covered with insulation at any position of the bellows.

Two layers of 1½-in.-thick mineral wool block insulation can be applied to an expansion joint that will be installed on preheated air ducts operating at temperatures between 500 and 613 F. Over the flat duct surface, 6-gage crimped wire is spot-welded to stiffeners spaced at 30-in. intervals along the duct. Then ¼-in. steel rods are run parallel to the duct axis between the stiffeners and crimped wire at about 6-in. intervals. Each length of rod is welded to the crimped wire at only one end to allow for expansion. The two layers of 1½ x 18 x 24 in. mineral wool blocks are staggered and wired individually to the rods.

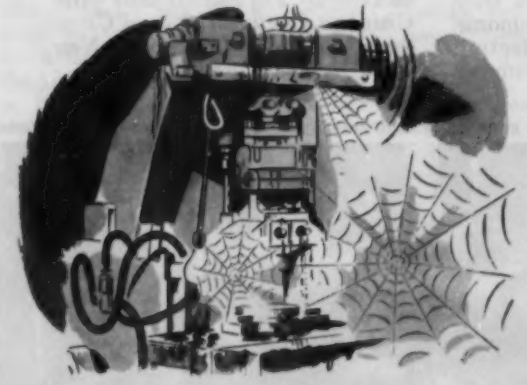
Crimped wire is tack-welded over the sheet-metal skirt at about 24-in. intervals along the expansion joint. Insulating blocks are held on the skirt surface by wire tied to the crimped wire between blocks. A ⅜-in. layer of mineral wool finishing cement and then a coat of asphalt mastic are applied over 1-in. wire mesh on all exposed insulation surfaces.

No Downtime in Three Years After Switching to Suntac

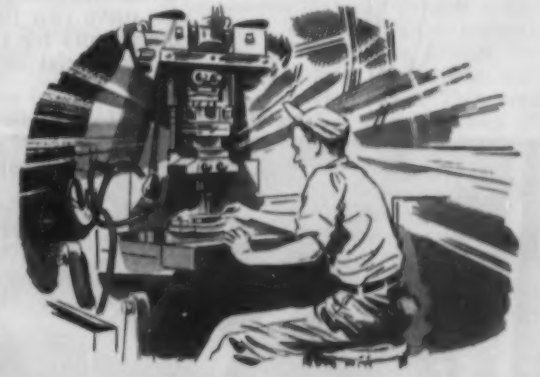


Metalworking firm was using heavy-duty stamping presses of an older type. Bearings were wearing excessively. Oil leaked constantly—on machines, floor and operators.

Lubricant loss was so severe that bearings frequently became so hot the machines had to be shut down until the bearings cooled. This cut sharply into production.



Bearings had to be replaced on an average of once every eight months. Repairs usually took four weeks, and during this time the machines as well as the floor space were completely non-productive.



Manufacturer switched to SUNTAC because it's especially compounded to cut leakage. No breakdown now for over three years. Oil consumption reduced 50%. Also using SUNTAC to lubricate other equipment.

Do you have machines with worn, leaky bearings? Or are you losing oil through excessive throw-off from rotating or sliding parts? SUNTAC is especially compounded to reduce drip, splash and squeezeout. Its greater adhesiveness makes it cling firmly to the parts it lubricates. Get all the facts about SUNTAC from your Sun Oil representative. Or write Dept. IP-11.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline

Circle 540 on Reply Card for more data

Two CP Diesels Keep The "Follies" on Ice

Here's an example of CP performance and reliability—a pair of Chicago Pneumatic Model 68 diesel engines that generate over an estimated 1,000,000 kwh a year for The New Haven Arena. Besides furnishing light and power for the entire arena consisting of auditorium, parking garage, service station, ice plant, block of stores, and executive offices, they also drive two 10 x 10 ammonia compressors for the manufacture of commercial ice in the summer and refrigeration for rink ice skating in the winter.

Rated at 180 hp, 600 rpm, these engines are typical of many CP installations where multiple power requirements call for absolute dependability and low operating cost. CP diesel, dual-fuel and gas engines are available in sizes capable of delivering from 120 hp to 1750 hp. For more details write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

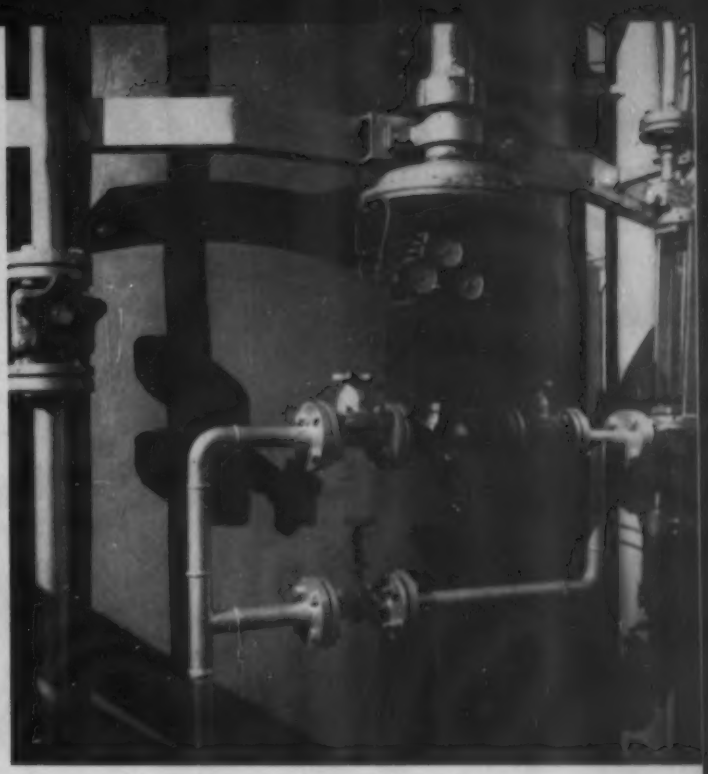
One of the two CP Model 68 diesel engines generating light and power for The New Haven Arena.

Chicago Pneumatic
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Circle 541 on Reply Card for more data

Lower Piping Costs With Lightweight Stainless Piping

I&P EXCLUSIVE



Corrosion-resistant process piping requirements in many industrial plants are such that lightweight stainless steel pipe and fittings make a neat, easily built, and economical installation.

EVERY ENGINEER responsible for the selection and installation of stainless steel pipe has known that when he specified standard weight (Schedule 40) pipe, he was asking for more than he needed and paying for a lot more stainless steel than the job required in about 90 percent of his piping projects. Usually, stainless steel pipe is specified because of its corrosion resistance and ability to handle contaminating fluids. Seldom do the pressures involved require anything like the wall thicknesses of Schedule 40. Until recently, there was no alternative to standard weight stainless steel pipe except tubing, and the use of tubing poses a major problem because its outside diameter is not the same as pipe. For example, the actual outside diameter of 1 in. stainless steel pipe is 1.315 in. The outside diameter of 1 in. tubing is 1.125 in. This means that tubing will not fit and cannot be used with fixtures originally designed for standard pipe dimensions.

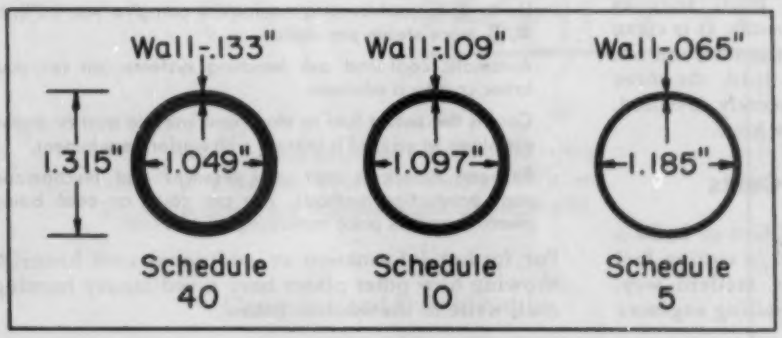
Recently, two new lightweight stainless steel pipes have found wide acceptance. These are known as Schedule 5 and Schedule 10. They have the same standard outside diameter, but the walls are thinner.

Despite the thinner walls, all sizes of these thin wall pipes will easily withstand 150 psi working pressure. Much higher working pressures are allowed for sizes less than 1½ in. At 150 psi, Schedule 40 standard pipe has a safety factor of 100 to 1. Schedule 10 has a safety factor of 83 to 1, and Schedule 5, a safety factor of 50 to 1.

Since schedule 5 and schedule 10 are designed with standard exterior dimensions, they can be used to tie-into any existing piping systems, valves, and other pipe fittings. An added advantage of the thin wall pipe is its lower costs. Thin wall stainless steel piping is priced 25 to 50 percent less than the conventional Schedule 40.

A major factor in the growing use of thin wall stainless steel piping is the availability of a wide line of fittings designed especially for use with this lighter pipe. One manufacturer (Speedline) offers designers a wide variety of fittings adaptable to butt-welded, fused, soldered, brazed, expanded, flanged, or socket type joints. With these fittings, thin wall pipe can be easily and directly connected to existing lines of either heavy wall pipe or tubing. The fittings can be hooked directly into valve gages and other accessories.

Installation is simple using these fittings. An Indianapolis fertilizer company reported that labor amounted to only 3.2 percent of the total cost of a thin wall piping project. The plant engineer of a chemical plant in Berkeley, California, who recently completed an installation, says that thin wall pipe is simple and speedy to put into place. He further emphasizes that there is no problem in making fittings when tying light weight pipe into existing standard type pipelines.



These diagrams compare the dimensional differences and wall thicknesses for Schedules 40, 10, and 5 of stainless steel pipe in the nominal 1 in. size.

For low-cost, dependable steam, Upjohn burns coal the modern way

Upjohn has long been famous as a manufacturer of pharmaceutical products. Because of the nature of these products, it was necessary that the steam plant of Upjohn's new Portage Road Plant, near Kalamazoo, Michigan, operate cleanly as well as economically. Therefore, coal was chosen to fire its boilers.

Today Upjohn's ultramodern steam plant supplies steam at only 40c to 42c per 1,000 pounds. It is clean and efficient, with no dust or smoke nuisances, and ash handling is fully automatic. At peak load, the three boilers shown above, plus a fourth recently installed, deliver up to 115,000 lbs. of steam per hour.

Investigate Your Fuel Costs

If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars every year.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available.

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

Automatic coal and ash handling systems can cut your labor cost to a minimum.

Coal is the safest fuel to store and use. No dust or smoke problems when coal is burned with modern equipment.

Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

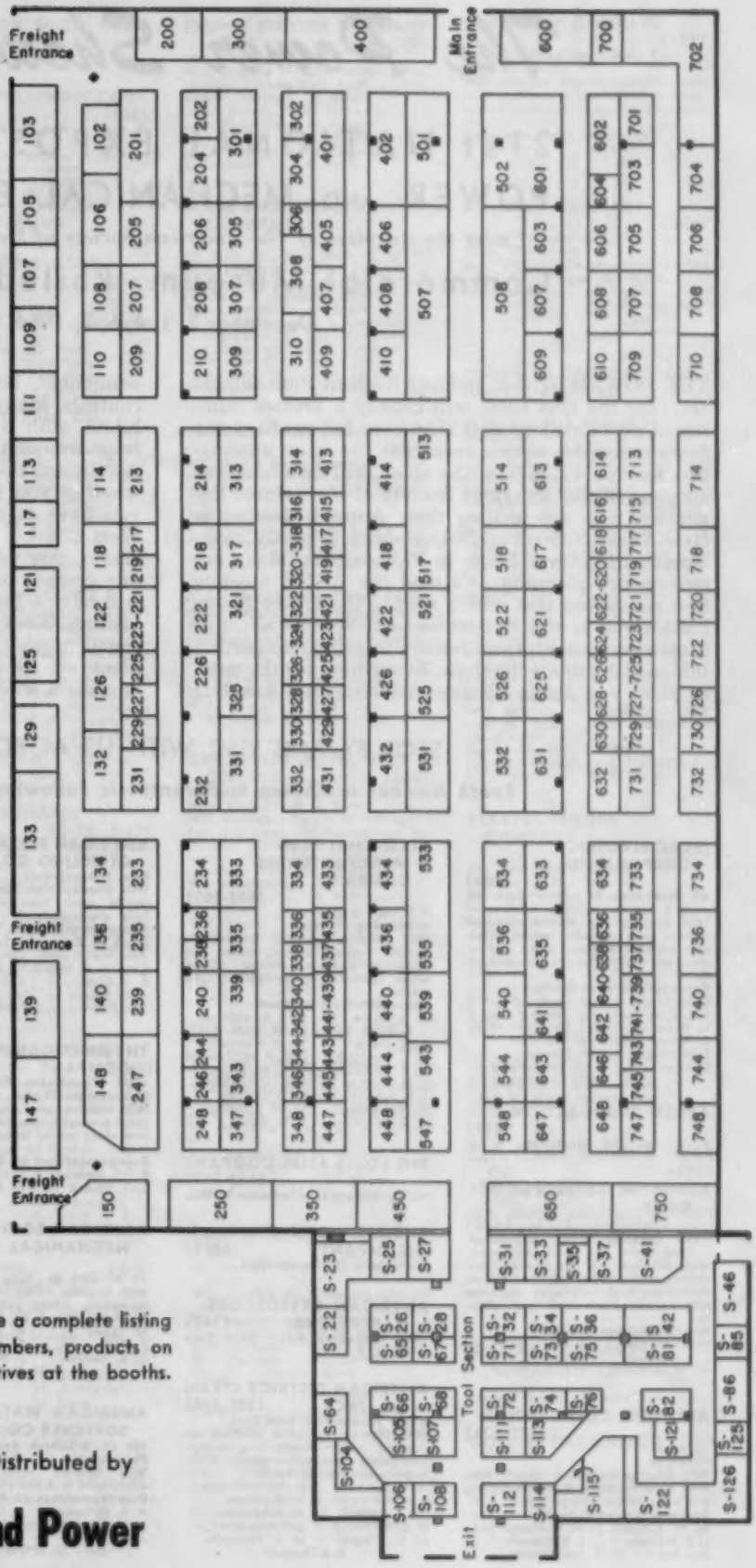
BITUMINOUS COAL INSTITUTE

A department of National Coal Association • Southern Building, Washington 5, D.C.

Circle 542 on Reply Card for more data

Visitors Guide to the Power Show

Commercial Museum
Philadelphia, Pa.
December 2-7, 1954



The following pages give a complete listing of exhibitors, booth numbers, products on display, and representatives at the booths.

Compiled and Distributed by

Industry and Power

The Power Show Guide

21st NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING

Under the Auspices of The American Society of Mechanical Engineers

Commercial Museum, Philadelphia, Pa.

December 2, 3, 4, 6, 7, 1954

THE POWER SHOW, holding forth in Philadelphia for the first time, will display a greater number of new developments than ever before, from the first marketable atomic reactor to the latest automation machinery. Again, the show will be under the auspices of the American Society of Mechanical Engineers, who are holding their Annual Meeting in New York, November 28-December 3, partly overlapping the Power Show in Philadelphia. Many engineers are planning to attend the ASME meeting first and follow that with a visit to the Power Show. Philadelphia is only 90 minutes from New York.

Steam equipment, from boilers to primary distribution, will dominate the show. Everything for the power plant will be on display including fuel handling equipment, boilers, valves, insulation, pumps, and controls. Many of the displays will be "action" exhibits, with motors running, pumps pumping, and traps trapping.

As always, the Power Show will be worth the visit whether you stay an hour or a week and whether you have to come from West Philadelphia or the West Coast.

Again, this year, INDUSTRY AND POWER, along with our companion publication, CONSULTING ENGINEER, will have a booth. It will be a booth you will enjoy visiting. We will display an interesting three-dimensional model of an industrial plant and a power plant . . . . a model that was actually used by the engineers who designed and laid out the plant.

STOP BY AND VISIT WITH US AT BOOTH 338

Booth Number Is Shown in Parenthesis Following Company Name

ACEC ELECTRIC CORPORATION (402)
40 East 49th St., New York 17, N. Y.
Will Display new NEMA standard motors, new variable speed drive, new adjustable speed drive and redesigned motors for special applications.
Representatives at Booth:
C. C. Parsily — J. Gody
S. L. Chaikind — J. Dricot
H. Feder — J. Re
E. Falleor — D. Wandycz
T. McVeigh — E. Healey
E. Allen — G. Rahenkamp

AERCO CORPORATION (417)
P. O. Box 248, Northvale, N. J.

AERODYNE DEVELOPMENT CORP. (432)
1520 Lakeside Ave., Cleveland, Ohio
Will Display dry mechanical dust collectors for industrial application, Paraclone high efficiency collector and Aerodyne low draft loss collector.
Representatives at Booth:
Mack Gordon — E. H. Green
E. L. Hobson — J. Sinko
W. H. Williams — P. F. Sherman

AEROQUIP CORPORATION (221-223)
Jackson, Michigan
Will Display flexible hydraulic hose lines with reusable fittings featuring a new socketless fitting.
Representatives at Booth:
M. W. Brandau — W. F. Ragge
L. S. Haymes — J. R. Roberts
Don Fox — Jay Osterle

ALLIS-CHALMERS MANUFACTURING COMPANY (502-601)
P.O. Box 512, Milwaukee 1, Wis.
Will Display vertical condensate pumps, vacuum pumps, steam and hydraulic turbines, motors, drives, water conditioning equipment, and tractors.
Representatives at Booth:
A. D. Brown — C. B. Rumble, Jr.
J. R. Allen — W. H. Taylor
R. H. Black — W. J. Weaver
N. L. Danforth — T. A. P. Williamson
H. E. Dickinson — H. L. Boyer, Jr.
J. H. Hadley — F. C. Osterland
J. F. Jenkins — C. D. Lawton
H. H. Kessler — W. H. Armitage
H. E. Lanphear — R. N. Brown

THE LOUIS ALLIS COMPANY (543-547)
427 E. Stewart, Milwaukee 7, Wis.

THE AMERICAN BRASS COMPANY (514)
Waterbury 88, Connecticut

AMERICAN CYSTOSCOPE MAKERS, INC. (347)
1241 Lafayette Ave., New York 59, N. Y.

AMERICAN DISTRICT STEAM CO., INC. (321-325)
North Tonawanda, New York
Will Display Corruflex packless expansion joints, piston ring expansion joints, heat exchangers.
Representatives at Booth:
A. H. Sy — L. J. Van Orden
E. A. Hahl — W. R. Shade
J. C. Webb — A. Ackerman
N. L. Reinwald — J. T. Meenan
M. G. Wilson — M. J. Hannah
E. R. Averett

AMERICAN FLEXIBLE COUPLING CO. (225)
Erie, Pennsylvania
Will Display high misalignment capacity gear type couplings with fully crowned teeth.
Representatives at Booth:
Frank W. Zurn — L. E. Trotter
John Henry Zurn — Edwin Harkins
Charles A. Weed — H. A. Kraeling
E. J. Ehrat — J. B. Kraeling
J. D. Kinsey — Les Campbell
Don Paddon — Fred Paddon

THE AMERICAN PULLEY COMPANY (647)
4200 Wissahickon Ave., Philadelphia 29, Pa.
Will Display new single adjustable groove sheave, new conveyor pulley, and other power transmission equipment.
Representatives at Booth:
R. H. Jackson — J. Healy
S. S. Stuard — H. Gordon

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (602)
29 W. 39th St., New York 18, N.Y.
Will Display ASME membership information, ASME publications.
Representatives at Booth:
M. Marty — N. M. Loseff
J. Date — O. Lagomarsino
C. R. Tunison — J. Wuelbern
R. Haffman

AMERICAN WATER SOFTENER CO. (642)
4th St. & Lehigh Ave. Philadelphia 33, Pa.
Will Display water conditioning equipment & Deaerators.
Representatives at Booth:
A. E. Kittredge — A. G. Scattergood
H. C. Waugh — R. Sampson
A. G. Zeigler — E. Schumann
G. S. Garrett

AMES IRON WORKS (532)
Oswego, New York
Will Display 100 hp Amestream generator and 15 hp model TP steam generator.
Representatives at Booth:
D. F. Lytle — Norris Jones

THE ANCHOR PACKING COMPANY (239)
401 North Broad St., Philadelphia 8, Pa.
Will Display all types of packings, mechanical rubber goods, and asbestos products.
Representatives at Booth:
D. M. Allan

THE V. D. ANDERSON COMPANY (713)
1935 West 96th St., Cleveland 2, Ohio
Will Display working model Hi-eF purifier, new Heat-Kwik Super Silvertop trap.
Representatives at Booth:
W. J. Gleason, Jr. — D. R. Snoke
Michael J. Toth

ARMSTRONG MACHINE WORKS (310)
Three Rivers, Michigan
Will Display a glass model of the 3912 inverted bucket steam trap as well as humidifiers, strainers, and various traps.
Representatives at Booth:
T. H. Rea — O. E. Ulrich
T. M. Reed

ATLAS VALVE CO. (324-326)
280 South St., Newark 5, N. J.
Will Display automatic valves and regulators.
Representatives at Booth:
J. E. Fachet — J. W. Pearson
P. C. Toomey — H. T. Wentworth
R. E. Vogt

AURORA PUMP CO.
(See New York Air Brake Co.)

AUTOMATIC SWITCH CO. (614)
391 Lakeside Ave., Orange, N.J.
Will Display solenoid valves—2, 3, and 4 way new compact designs; electromagnetic controls, automatic transfer switches, remote control switches, contactors, relays.
Representatives at Booth:
W. F. Hurlburt, Jr. — Frank Spinelli, Duncan Jarvis
R. F. McCormick — Walt Ozimek
Gordon Curran — F. Melbourne
A. Churchill

BUILDERS PROVIDENCE B-I-F INDUSTRIES, INC.
(see Builders-Providence and Proportioneers, Inc.)

A. G. BANNING, J. (S-25-S-27)
50 Church St., New York 7, N.Y.

BARRETT-CRAVENS COMPANY (339-343)
630 Dundee Rd., Northbrook, Ill.
Will Display hand and electric lift trucks, fork trucks, Steeleg skids, portable elevators.
Representatives at Booth:
O. M. Lund — J. J. Curry
C. E. Barnes — E. J. Heimer

BARROWS PORCELAIN ENAMEL COMPANY (730)
Langdon & Wiehe Rd., Cincinnati 13, O.
Will Display glass lined heater tubes for air preheaters and glass lined process pipe.
Representatives at Booth:
A. L. Diederich, Jr. — W. A. Barrows, C. E. Meyer
M. S. Umbenhauer

BEAUMONT BIRCH COMPANY (443)
1505 Race Street
Philadelphia 2, Pennsylvania
Will Display enlarged photos of installations of coal and ash handling system and storage systems—also chemicals handling equipment.
Representatives at Booth:
W. G. Davenport — W. J. Preusch
C. McMullen — H. R. Purcal
R. K. Hampton — S. T. Transeau

BEAVER PIPE TOOLS, INC. (S-113)
Warren, Ohio
Will Display pipe tools and machines
Representatives at Booth:
Paul Knauff — Russ Herig
Jack Gougler — Ray Barkley

BEEMER ENGINEERING COMPANY (229)
401 N. Broad St., Philadelphia, Pa.
Will Display Oilite bearings and powdered metal parts, Heli-Coil inserts, O-Rings, flexible ducting, and plaster mold castings.
Representatives at Booth:
Frank Beemer — W. A. Strauss, Jr.
A. J. Diesinger, Jr. — S. M. Krauser, A. H. Schawrz
H. G. Silcox, 3rd — D. A. Talbot, Jr.
S. L. Kelly — D. R. Blair
F. X. McHugh

BELCO INDUSTRIAL EQUIPMENT DIVISION, INC. (304)
52 Iowa Ave.,
Paterson 3, N. J.

BELTRAN ASSOCIATES, INC. (348)
1133 E. 35th St., Brooklyn, N. Y.
Will Display industrial heating equipment.
Representatives at Booth:
E. V. Beltran — A. Moreda
R. Beltran — T. Lognidice

R. C. BENSON, M. E. (122)
4900 Wayne Avenue,
Merchantsville 8, N. J.

BERGEN PIPESUPPORT CORP. (150)
50 Church Street, New York 7, N. Y.
Will Display new designs of constant and variable supports.
Representatives at Booth:
L. Curcio — V. Oberhofer
H. Erikson — F. Winser
R. G. Ford

BETA ELECTRIC CORP. (737)
333 E. 103rd St.,
New York 29, N. Y.
Will Display D.C. overpotential testers.
Representatives at Booth:
Victor Wouk — Leon Levy
Ivan Robinson — Paul Baver

JAMES G. BIDDLE CO. (608)
1316 Arch St, Philadelphia 7, Pa.
Will Display Megger electrical testing instruments, Frahm Resonant Reed tachometers & frequency meters.
Representatives at Booth:
A. F. Zell — T. V. Cooper
A. Q. Lange — K. Loebl
E. E. Lange — Wm. Foster
S. Sommer

BOILER ENGINEERING & SUPPLY CO., INC. (106)
Manavon St., Phoenixville, Pa.
Will Display a packaged type boiler — 75 hp high pressure with modulating controls — burning $26 oil.
Representatives at Booth:
R. E. Keen — R. E. Emrich, Jr.
W. B. Riley — J. A. Hohenleitner
R. E. Emrich, Sr. — P. D. Goggin
W. W. Palm — P. W. Hunsicker
D. C. Story — J. B. Keleman
R. W. Williams — M. R. Cushman
D. L. Wilson — W. C. Wanner

BOLENZ & SCHAFER (S-25, S-27)
50 Church St., New York 7, N.Y.

CHARLES BOND CO. (334)
617 Arch St., Philadelphia 6, Pa.
Will Display gears, sprockets, speed reducers, flexible insulated couplings, and truck casters.
Representatives at Booth:
C. C. Bond — L. T. Williams
C. C. Bond, Jr. — L. H. Martin
Fred W. Neal — Elwood Farley

BOSTON GEAR WORKS (126)
Quincy 71, Mass.
Will Display gears, Bear N Bronz, Bost Bronz, Shold A Grip with sprockets, chains, pillow blocks, and flanged cartridges.
Representatives at Booth:
M. T. Schumb — T. C. Howard
W. J. Johnson — C. G. Beh
E. P. Williams — J. H. O'Neil
L. Nagy — A. G. Menge
C. Maves — A. Issacs
H. A. Lightfoot

BOWSER, INC. (610)
1302 E. Creighton Ave.,
Ft. Wayne, Ind.
Will Display liquid control equipment. Turbine oil conditioner; Xacto automatic liquid blender; Xacto industrial meter; Rotorol meter; flow sights.
Representatives at Booth:
H. J. Slack — W. J. Powers
H. E. Smith — M. Bayer
J. E. Collins — R. E. Sampson
E. A. Simminger — J. H. Parente
J. W. Clokey — C. Atherton

BROOK MOTOR CORP. (635)
3555 W. Peterson Ave., Chicago 45, Ill.
Will Display electric motors
Representatives at Booth:
P. L. Loewe — M. E. Stern

BROWN FINTUBE COMPANY (226-232)
300 Huron St., Elyria, Ohio
Will Display Fintube boilers, fired heaters, Fintube tank heating coils.
Representatives at Booth:
J. W. Brown, Jr. — A. Nihlen
J. R. Blakeslee — G. Ryan
C. B. Thaw — A. H. Schories
L. C. Johnston — W. Knopfel
E. J. Skiba — D. Foltz

BUELL ENGINEERING COMPANY, INC. (121-125)
70 Pine St., New York 5, N. Y.
Will Display electric precipitator and mechanical collector for the recovery of industrial dust.
Representatives at Booth:
J. A. McBride — N. L. Guiricich
S. J. Pascual — J. H. Brummer
J. L. Schumann — F. V. Zendzian
O. V. Norvig — H. C. Dohrmann
C. A. Gallaer — J. W. Schindeler
F. Sohlman — L. L. Nagel

BUILDERS-PROVIDENCE, INC. (204)
345 Harris Ave., Providence, R.I.
Will Display Dowl Flow-Tube differential producer and HCVS Chlorinizer.
Representatives at Booth:
R. M. Gwynne — R. W. Pearce
F. W. Deutsch — J. W. Westfall
E. B. Lynch

A. M. BYERS COMPANY (208)
Clark Building, Pittsburgh, Pa.
Will Display wrought iron products and electric furnace steel products.
Representatives at Booth:
B. M. Byers — J. H. Litle
H. R. Rowland — W. J. Mayer
E. L. MacWhorter — V. C. Lawrence
H. K. King — R. H. Clay
J. W. Cooper — F. E. Farnan

CAMBRIDGE INSTRUMENT CO., INC. (102)
Grand Central Terminal
New York 17, New York
Will Display single and multi-point gas analyzers; pH meters and recorders; dissolved O_2 and H_2S analyzers; SO_2 analyzers; surface pyrometers; moisture meters.
Representatives at Booth:
R. H. Kruse — H. B. Huxley
Carl Kruse — G. B. Lewis
K. P. Royce — W. H. Jefferson
B. O. Watkins — L. C. Kruse
A. T. Frieling — Thos. Germano
G. B. Hollerith — J. D. Digby
H. F. Matthiessen — S. B. Young
R. Mills

THE PHILIP CAREY MFG. CO. (634)
320 South Wayne Avenue,
Cincinnati 15, Ohio
Will Display 85% magnesia insulation pipe coverings for all temperature ranges, construction materials for the power plant, an all-asbestos duct.
Representatives at Booth:
C. M. Brasher — C. D. Spaid
R. C. Bressan — L. C. Underwood
J. C. Rector — C. H. Zimmerman

CARPENTER & PATERSON, INC. (422)
18 Hurley St., Cambridge 41, Mass.
Will Display pipe hangers and supports.
Representatives at Booth:
George Paterson — W. V. Bowen, Jr.
S. C. Paterson — W. C. Kroberger
G. E. Paterson — Walter Hunt
Walter Rowe

CHEMICAL DEVELOPMENT CORP. (729)
Danvers, Massachusetts
Will Display Devcon — the plastic steel; Gaff bond #334 — bonding agent for grinding segments; Tool Strip—strippable coatings for tools.
Representatives at Booth:
A. M. Creighton, Jr. — F. J. Albanese, G. E. Gaine
G. Odell

CHEMIQUIP COMPANY (719)
460 West Broadway, New York 12, N. Y.
Will Display porous metallic pressure snubbers, aircraft type snubber, sealed system snubber, Mercureceiver mercury trap.
Representatives at Booth:
J. A. Lipman — M. Morton
(Mrs.) J. A. Lipman

CHIKSAN COMPANY (305)
330 N. Pomona Ave.,
Brea, California
Will Display Chiksan ball-bearing swivel joints and assemblies.
Representatives at Booth:
L. J. Smith — J. F. Powers, Jr.
E. T. Landgraff — R. T. Jones
C. E. Thomas — E. N. Thomas

CHRYSLER CORPORATION—AMPLEX DIVISION (134)
P. O. Box 2718, Detroit 31 Michigan
Will Display heavy-duty, oil-cushion Oilite bearings, metal powder parts of steel oilite, stainless steel, iron, bronze, and other metals.
Representatives at Booth:
Frank Beemer — A. H. Schwarz
A. J. Diesinger, Jr. — F. X. McHugh, D. A. Talbot, Sr.
H. G. Silcox, 3rd — D. A. Talbot, Jr.
S. L. Kelly — R. H. Talbot
W. A. Strauss — D. R. Blair
S. M. Krauser — J. G. Paluseo
G. B. Schoeps

THE CLARK CONTROLLER CO. (733)
1146 E. 152 St.,
Cleveland, Ohio
Will Display d-c contactors, new machine limit switch, adjustable speed drives.
Representatives at Booth:
P. L. Offenhauser — O. L. Holcombe
F. H. Neuhardt — M. B. Egan

CLEAVER BROOKS COMPANY (147)
326 East Keefe Avenue
Milwaukee 12, Wisconsin
Will Display newly announced CB-40 and CB-80 self-contained boilers.
Representatives at Booth:
J. C. Cleaver — F. A. Loebel
E. A. Kovic — A. E. Miller
H. F. Holtz — F. I. Raunds
F. W. Hainer — J. W. Stevens
F. A. Hoop — H. R. White
F. L. Phillips — V. N. Harwood
V. A. Starace — A. A. Wood
O. E. Jacobsen — J. U. Kaye
P. M. Wright

CLEMENTS MFG. CO.
6650 S. Narragansett Ave.
Chicago 38, Ill.

CLEVELAND WORM & GEAR CO. (522)
3249 E. 80th St., Cleveland 4, Ohio
Will Display worm gearing, worm gear speed reducers, variable speed drives.
Representatives at Booth:
D. H. Rowe — L. O. Witzenburg
W. M. Stilwell, Jr. — T. B. Ryan, J. T. Gordon
J. A. Gordon

CLIPPER BELT LACER COMPANY (419)
Grand Rapids 2, Michigan

COLLINS PACKING CO., INC. (346)
401 North Broad Street
Philadelphia 8, Pennsylvania
Will Display mechanical packings and molded rubber items.
Representatives at Booth:
J. D. Ferguson — C. D. Kirkpatrick
G. E. Whitehair — K. W. Carroll

CONNERY CONSTRUCTION COMPANY (613)
Second & Luzerne Streets
Philadelphia 40, Pennsylvania
Will Display models duct work, expansion joints, dampers.
Representatives at Booth:
A. D. Stewart, Sr. W. F. T. Chidester
A. D. Stewart, Jr. R. C. Stewart

CONSULTING ENGINEER (338)
420 Main St., St. Joseph, Mich.
Will Display scale model of industrial and power plant. Latest issue of CONSULTING ENGINEER and recent reprints will be available.
Representatives at Booth:
E. R. Gauley — Hunter Hughes
O. D. Young — A. M. Steinmetz
T. E. Gordon — H. A. Bergen
J. D. Murray — F. E. Hischfeld
D. L. McKechnie — J. E. Hinkley
Justin Hannon — J. C. Dean

CYCLOTHERM DIVISION U. S. RADIATOR CORPORATION (450)
Oswego, New York
Will Display package boilers.
Representatives at Booth:
F. J. Garahan — W. W. Clark
R. P. Leonard — E. J. Zisek
A. P. Saha — A. M. Willett

THE DAMPNEY COMPANY (540)
Hyde Park, Boston 36, Massachusetts
Will Display protective coatings for metal, engineered for specified power service.
Representatives at Booth:
J. D. Bird — W. T. Campbell

THE DAYTON RUBBER CO. (110)
2342 Riverview Ave., Dayton 7, Ohio
Will Display v-belting and pulleys.
Representatives at Booth:
L. C. Strobeck — J. C. Tracy
J. W. Torrant — L. J. Adams
W. T. McCoy — D. J. Jones
A. L. Van Der Kar — J. R. Young
H. B. Coleman

THE DE LAVAL SEPARATOR COMPANY (606)
Poughkeepsie, New York
Will Display Uni-matic oil purifier, Puri-filter.
Representatives at Booth:
W. C. Porch — D. M. Landis
F. E. Barrett — G. F. Wheelwright
F. E. Lawatsch — G. G. Teren

DE WALT, INC. (S-22)
Lancaster, Pennsylvania
Will Display A.M.F. De Walt "Power Shop"
Representatives at Booth:
S. S. Auchincloss — Conde Hamlin
A. J. McMurray — J. Stolars
A. E. Richardson — Dick Wagner
John O'Reilly — Vinc. Marino

DE ZURIK SHOWER CO. (421)
Sartell, Minnesota
Will Display easy operating plug valves.
Representatives at Booth:
D. De Zurik, Jr. — W. B. O'Connell

DIEHL MANUFACTURING COMPANY, FINDERNE PLANT (714)
Ulrush & Sommerville Street
Somerville, New Jersey

HENRY DISSTON & SONS, INC. (S-36)
Philadelphia 35, Pennsylvania
Will Display saws, tools, files, knives, steel.
Representatives at Booth:
L. W. Jander — George Hopf
R. MacWhorter — J. Dingee
V. Hawksley — H. Muschenheim

DOWELL, INC. (409)
Kennedy Bldg., P. O. Box 536
Tulsa 1, Okla.

DUDCO DIVISION, THE NEW YORK AIR BRAKE CO. (702)
(See New York Air Brake Co.)

DURABLA MANUFACTURING CO. (700)
114 Liberty St., New York 6, N.Y.
Will Display pump valves, check valves, compressed asbestos sheet packing and gaskets.
Representatives at Booth:
J. G. Buechel — L. M. Witt
N. J. Walsh

DURAMETALLIC CORP. (447)
Kalamazoo, Michigan
Will Display mechanical seals, metallic packing, packing tools.
Representatives at Booth:
J. L. McQuillen — John Cronin
R. S. Cummings — Ray Stromoski

EAGLE SIGNAL CORP. (318)
Moline, Illinois
Will Display interval timers, program timers, predetermining counters, and a new pneumatic delay timer.
Representatives at Booth:
E. F. Havey — W. J. Wadas
W. F. Keegan — W. M. Leech, Jr.
C. H. Comiskey — W. A. Hallock
W. A. Woehr

THOMAS A. EDISON, INC. INSTRUMENT DIVISION (720)
West Orange, New Jersey
Will Display continuous (non-scanning) temperature monitoring system and complete line of temperature sensitive elements.
Representatives at Booth:
V. Rose — H. Karp
A. B. Poe — A. Ruegg
A. Dietz — G. Bindewald
H. G. Riter IV

ELASTIC STOP NUT CORPORATION OF AMERICA (630)
1027 Newark Ave., Elizabeth, N. J.

THE ELECTRIC CONTROLLER & MANUFACTURING COMPANY (333)
2700 East 79th Street
Cleveland 4, Ohio
Will Display air and oil break starters for 2200-5000 volt-motors having 50,000 kva interrupting capacity.
Representatives at Booth:
I. H. Peak — O. J. Archer
G. S. Steffey — D. R. Ward

ELECTRICAL WORLD (747)
330 West 42nd Street
New York 36, New York
Will Display an electrical publication.

ELECTRO-ARC MANUFACTURING CO. (S-64)
P.O. Box 448, Ann Arbor, Michigan

ELECTROMATIC WATER TREATMENT, INC. (745)
241 Church Street, New York 13, N. Y.
Will Display automatic water conditioners for boilers and hot water systems.
Representatives at Booth:
E. F. McCarthy — Syl W. Gintell
Richard Wylegala — Leon J. Wylegala
Francis Gamble — Gordon Holland
Edward Dana — Neal Rassa

ENERGY CONTROL COMPANY, INC. (720, 722, 730, 732)
5 Beckman St., New York 38, N.Y.

JOHN R. ETLAR COMPANY (244)
230 Regester Avenue
Baltimore 12, Maryland
Will Display "Door Seal" for trucks, Schinker drum tools, and Exide emergency lights.
Representatives at Booth:
J. R. Etlar — M. G. Etlar

EVERLASTING VALVE CO. (433)
49 Fisk Street
Jersey City 5, New Jersey

FAIRBANKS, MORSE & CO. (650)
600 South Michigan Avenue
Chicago 5, Illinois

FALSTROM COMPANY (707)
Falstrom Court, Passaic, N. J.
Will Display instrument and control panels, aluminum fabrications, cabinets, power supply racks and frames.
Representatives at Booth:
R. E. Hill — E. W. Ricker
C. Schanzenbach — C. Polderman
W. H. Muench — H. Steinman

FARRAND OPTICAL COMPANY, INC. (744)
4401 Bronx Blvd., New York 70, N. Y.
Will Display optical tooling instruments for precision alignment of turbines and other heavy machinery; automation controls for machinery.
Representatives at Booth:
C. L. Farrand, Jr. — Charles Urban
James Winget — John H. Steele

THE FARVAL CORP. (522)
3249 East 80th Street
Cleveland 4, Ohio
Will Display manual and automatic centralized lubrication systems.
Representatives at Booth:
D. H. Rowe — W. M. Stilwell, Jr.
L. W. Witzenburg — J. T. Gordon
T. B. Ryan — J. A. Gordon

FENWAY MACHINE CO. (S-65)
263 N. 23rd St.
Philadelphia 3, Pa.

FLEXITALLIC GASKET CO. (703)
8th & Bailey Streets, Camden 1, N. J.
Will Display Flexitallic spiral-wound gaskets for steam and related power plan service, including fuel oil and lubricating oil service.
Representatives at Booth:
W. W. Boyd — N. A. Mucci
S. S. Lippincott — W. R. Price

FLEXONICS CORP. (314)
1335 South Third Avenue
Maywood, Illinois
Will Display Flexon expansion joints, Flexon metal hose, Flexon expansion compensators.
Representatives at Booth:
E. L. Hiter — M. D. Thackaberry
E. W. Driedger — M. J. Mitchell
D. E. Wolf — R. M. Quick
H. W. Griesbach — J. H. Zabel
D. W. Ankeney — G. W. Darum
J. J. Bertram — R. M. Fletcher
C. C. Nieman

FOLEY MANUFACTURING COMPANY (S-42)
3300 N. E. Fifth Street
Minneapolis 18, Minnesota
Will Display Foley saw filers, retoothers, setters, circular saw grinders.
Representatives at Booth:
W. W. Fritts — Duane McConnell
P. C. Hartmann — Bruce Bartel

FOSTER ENGINEERING CO. (722)
835 Lehigh Avenue, Union, New Jersey
Will Display automatic valves, safety valves, flow tube and control valves.
Representatives at Booth:
H. Rodewald — C. S. Beard
G. Bauer — R. E. Tarring
V. Gentile, Jr. — J. Ur
V. J. Luby

THE FOXBORO CO. (350)
Foxboro, Mass.
Will Display industrial instrumentation for indicating, recording, and controlling process variables.
Representatives at Booth:
W. H. Howe — E. Slone
V. V. Tivy — O. Hammer
R. Milham — E. Huckman
R. Silva — A. Maibaum
J. Deaderick — K. Barton
V. Pardo — J. Hawkins
R. Sweet — R. Justis
M. Kessel

FULLER COMPANY (213)
Fuller Building, Catasauqua, Pa.
Will Display Fuller rotary two-stage compressor, feeder, bin signal, aeration unit, F-H Airslide conveyor section.

FURNAS ELECTRIC CO. (626-628)
1000 McKee Street, Batavia, Illinois
Will Display electric motor controls featuring in-between ratings.
Representatives at Booth:
W. C. Furnas — F. Lawrence
W. A. Meyer — J. B. Blass
C. H. Ribble — J. O'Rourke
E. A. Parman

GAI-TRONICS CORP. (240)
607 Washington St.
Reading, Pa.

THE GARLOCK PACKING CO. (536)
Palmyra, New York
Will Display a line of mechanical packings and allied items.
Representatives at Booth:
J. B. Sewell — L. B. Snyder
C. F. Palmer, Jr. — A. C. Mohn
R. C. Shaw — W. L. Mikell
W. J. Lauter — F. Wilders
E. T. Parsons

GENERAL CONTROLS CO. (646)
8080 McCormick Blvd., Skokie, Ill.
Will Display hydramotor valves; solenoid valves; proportioning valves; temperature & pressure controls.
Representatives at Booth:
F. E. Weldon — F. Forsman
R. L. Strongman — J. Crandley
Jim Kelly — W. J. Darragh
Lee Liepin — F. Hodgins
Ray LaFevre — John Mackin
R. Barger

GENERAL FITTINGS CO. (436)
123 Georgia Ave., Providence 5, R. I.

GENERAL RADIO COMPANY (234)
275 Massachusetts Ave. Cambridge 39, Mass.
Will Display electric instruments for industry: noise measuring equipment, stroboscopes, Variac autotransformers, line-voltage regulators, megohmmeters, and polariscope for stress analysis.
Representatives at Booth:
W. R. Thurston — C. W. Harrison
M. A. Gilman — G. G. Ross
H. H. Dawes

GENERAL REFRACTORIES CO. (633)
1520 Locust St., Philadelphia 2, Pa.

THE GLOBE CO. (342-344)
GRIP-STRUT DIVISION
4000 S. Princeton Ave.,
Chicago 9, Ill.

GLOBE STEEL TUBES CO. (439-441)
3839 W. Burnham St., Milwaukee, Wis.
Will Display steel tubing and fittings.
Representatives at Booth:
W. B. Dickey — J. J. Lukens
E. Gammeter — Lee Mullen
F. K. Krell — P. C. Lewis
A. D. Zar

JAMES T. GORDON CO. (522)
233 Broadway, New York 7, N. Y.
See The Cleveland Worm and Gear Co.

GOSS GAS, INC. (425)
Route 28, Glenshaw, Pennsylvania
Will Display LP gas and furnace equipment.
Representatives at Booth:
J. W. Swinefore — W. Checkeye
G. Hubley

GRAHAM TRANSMISSION INC. (332)
Menominee Falls, Wisconsin
Will Display Speed Corrector, a new super accurate variable speed drive. Also infinitely variable speed drives.
Representatives at Booth:
P. C. Read — R. Humburger
F. C. Howell — T. Lanman
L. A. Graham — J. Feeley
R. A. Graham — E. N. Gilling
W. B. Clarkson — J. Boyko
R. Johnson, Jr. — C. R. Durling, Jr.
W. A. Jackson, Jr. — E. M. Frost, Jr.
L. H. Flaherty — P. Moll

GRINNELL COMPANY, INC. (531)
250 W. Exchange St.
Providence 1, R. I.
Will Display pipe fittings, valves, pipe hangers, welding fittings, prefabricated piping, spring hangers, unit heaters.

GULF OIL CORP. (708)
Gulf Bldg., Pittsburgh 30, Pa.

HAGAN CORPORATION (544)
Hagan Bldg., 323 Fourth Ave.
Pittsburgh 22, Pa.

HAGEN MFG. CO., INC. (320)
202 20th St., Moline, Ill.
Will Display synchronous timing motors, a new Model 56 high torque motor, and a new count limitor switch.
Representatives at Booth:
E. F. Havey — W. F. Keegan
A. W. Rummery

HARBISON-WALKER REFRACTORIES COMPANY (209)
1800 Farmers Bank Bldg.
Pittsburgh 22, Pa.
Will Display a complete line of refractory products for the power industry.
Representatives at Booth:
J. E. O'Reilly — R. R. Miller
H. G. Hart — H. S. Schweinsberg
John W. Mull — H. C. Willenbrock
P. B. Richardson — J. Mitchell
G. W. Webster — K. E. Taaffe
E. C. Ullom — R. W. Cassidy

LOUIS H. HEIN COMPANY (206)
Ardmore, Pennsylvania
Will Display industrial lubricating and hydraulic equipment.
Representatives at Booth:
C. O. Anthony — D. M. Pentz
H. E. Droneburg — A. J. Herkalo
G. A. Hayes — F. J. Wengerter
R. C. McCreary — T. H. Kane
R. J. Connell

HELI-COIL CORP. (231)
Shelter Rock Lane, Danbury, Conn.
Will Display screw thread inserts and tools, screw-lock inserts.
Representatives at Booth:
Howard Haas — P. Wolfe
E. Baruch — J. Fasano
B. Morgan — W. Wolk

HEWITT-ROBINS, INC. (148)
666 Glenbrook Rd.,
Stamford, Conn.

THE HEWSON COMPANY, INC. (405)
443 Broad Street, Newark 2, N. J.
Will Display high voltage d-c insulation test sets, high speed static control systems, static detection and alarm systems, automatic ground controls.
Representatives at Booth:
J. K. Hewson — R. H. Metz
W. E. Krause — W. G. Overman

HILLS-McCANNA CO. (207)
3025 N. Western Ave.,
Chicago, Ill.
Will Display Saunders patent diaphragm valves and chemical proportioning pumps including the new Hills-McCannameter.
Representatives at Booth:
C. A. Howe — H. Anderson
R. T. Kidde — R. S. Rhoades
R. McFarland — R. E. Lindquist
W. Mashinter — H. P. Oriebeke
E. F. Miller — V. M. Barber

HONAN-CRANE CORP. (736)
Lebanon, Indiana
Will Display Houdaille Purivac unit, Houdaille Dri-Pure unit, oil purifier, and filter elements.
Representatives at Booth:
J. F. Harms — W. J. Holder
L. B. Duntley — J. D. Weatherford
W. S. James — A. G. Magrauth
E. O. Wolgast — A. R. VanDeWeghe
J. E. Pirie

THE HOT OIL HEATER, DIV. OF MOUNTAIN STATE FABRICATING CO. (643)
P.O. Box 1146, Clarksburg, W. Va.

HOMESTEAD VALVE MANUFACTURING CO. (235)
P. O. Box 348, Coraopolis, Pa.
Will Display new line of lubricated plug valves, new hypressure Jenny steam cleaner, boiler blow-off valves, lever-sealed and cam-sealed plug valves, and protected seal hydraulic operating valves.
Representatives at Booth:
F. E. Schuchman — P. D. Martin
Fred Schuchman — E. G. Johnson
C. E. Wolford — J. H. Selmenda

HUNGERFORD & TERRY, INC. (233)
226 Atlantic Av., Clayton, N. J.
Will Display manual, semi-automatic and fully automatic zeolite water softeners, filters, high capacity resinous zeolites, and demineralizers.
Representatives at Booth:
G. Lang — S. F. Alling
C. Ogg — A. J. Nauta
F. C. Myers — R. Heidorn
R. Davis

HYDRECO DIVISION, THE NEW YORK AIR BRAKE CO. (702)
(See New York Air Brake Co.)

INDUSTRIAL PRESS, THE (715)
148 Lafayette St.,
New York 13, N. Y.
Will Display Machinery magazine, Heating & Ventilating magazine, and engineering books.
Representatives at Booth:
C. C. Lukens — T. A. Earing
C. I. Sommer — H. J. Twine
C. O. Herb

INDUSTRIAL PRODUCTS ENGINEERING CO. (336)
26-40 Jackson Ave.
Long Island City, N. Y.
Will Display conveyors, dust collectors and automatic ramp, electrically operated.
Representatives at Booth:
W. Field — J. C. Somers
P. Rizzo

INDUSTRY AND POWER (338)
420 Main St., St. Joseph, Mich.
Will Display scale models of industrial and power plants. Latest issue of INDUSTRY AND POWER and recent reprints will be available.
Representatives at Booth:
E. R. Gauley — Hunter Hughes
D. L. McKechnie — A. M. Steinmetz
T. E. Gordon — H. A. Bergen
F. S. Brandt — F. D. Hirschfeld
J. D. Murray — J. E. Hinkley
Justin Hannon — J. C. Dean

INSTRUMENTS PUBLISHING CO. (429)
845 Ridge Ave., Pittsburgh 12, Pa.
Will Display periodicals and books on instrumentation.
Representatives at Booth:
R. Rimbach, Sr. — R. Maxwell
R. Rimbach, Jr. — R. Donnelly
M. Aronson — M. J. Nervie
M. F. Behar — C. F. Goldcamp
David Aland — H. Haskett
James Emge — S. Wright
Martha Rimbach — E. Wright
G. Rimbach — M. D. Pugh
H. Short, Jr.

INSULATING CONCRETE CORP. (426)
3100 K St., N.W.,
Washington 7, D. C.

THE INTERNATIONAL NICKEL CO., INC. (508)
67 Wall St., New York 5, N. Y.

IRVING SUBWAY GRATING CO., INC. (117)
50-09 27th St.,
Long Island City, N. Y.
Will Display open metal flooring and treads, gridsteel, floor armoring and bridge decking.
Representatives at Booth:
L. F. Fontana — A. B. Jopson
J. E. Skillman — G. H. Farrington

JANNEY CYLINDER CO. (114)
Holmesburg, Philadelphia 36, Pa.

JENKINS BROS. (250)
100 Park Ave.,
New York 17, N. Y.

JIFFY TOOL SUPPLY CO. (S-81)
109 E. Nine Mile Rd.,
Ferndale 20, Mich.

JOHNS-MANVILLE SALES CORP. (111)
22 E. 40th St.,
New York 16, N. Y.

THE JOHNSON CORP. (308)
Three Rivers, Michigan
Will Display pipe supported and self supporting rotary pressure joints, solenoid operated valves, instant steam water heaters, compressed air aftercoolers and separators.
Representatives at Booth:
R. O. Monroe — R. Z. Jones
J. W. Hieronymus — J. W. Kalkhof
W. R. Monroe — W. McNiff
T. O. Monroe — J. Croce
J. L. Read — T. Campbell
R. W. Gotschall — V. Rainsford
C. W. Gill — W. T. Harding, Jr.
H. C. Annable — J. R. Greenhalgh
J. R. Croes — B. Costello

THE JOHNSON MARCH CORP. (723)
1724 Chestnut St.,
Philadelphia, Pa.
Will Display liquid dust control systems for coal handling and fly ash dust problems.
Representatives at Booth:
R. B. Epperson — J. A. Guimond
W. B. Aarons

E. B. KAISER CO. (750)
2114 W. Lake Ave., Glenview, Ill.
Will Display underground and overhead insulated piping systems, heat exchangers, suction heaters, tank heaters, jacketed and viscous liquid piping systems.
Representatives at Booth:
E. B. Kaiser, Jr. — J. Daniel Rupert

KEASBEY & MATTISON CO. (526)
Ambler, Pennsylvania

KEENEY PUBLISHING CO. (415)
6 North Michigan Avenue
Chicago 2, Illinois

KENT COMPANY, INC. (648)
Rome, New York
Will Display a complete line of floor maintenance equipment including floor scrubbing machines for wet and dry work.
Representatives at Booth:
C. E. Clifford — P. V. Hugues
Fred H. Ide — P. T. Hugues
Dick Bauchmoyer — Ed Wittischiebe
Joe Hugues — Frank Howard

KEYSTONE TOOL CORP. (740)
5325 Kirby Drive, Houston, Texas
Will Display butterfly valves, fluid pump pistons, check valves, ceramic lined mud gun nozzles, chokes for Christmas trees, mud mixer nipples.
Representatives at Booth:
C. K. Stillwagon — John Place
J. C. Stillwagon — R. H. Parry
W. H. Ramsey — H. M. Summerell
Dale Prentice, Jr. — R. W. Steves
Gerald Herrema — R. W. Sexton
H. E. Maland

THE KIESERLING & ALBRECHT COMPANY (S-25, S-27)
50 Church St., New York 7, N. Y.

KINNEY MANUFACTURING COMPANY, SUBSIDIARY OF THE NEW YORK AIR BRAKE COMPANY (702)
(See New York Air Brake Co.)

THE KLINGER CORPORATION OF AMERICA (219)
95 River St., Hoboken, New Jersey

JOSEPH KOPPERMAN & SONS (227)
308-316 New St. Philadelphia 6, Pa.
Will Display packless corrugated expansion joints.
Representatives at Booth:
Paul Kopperman — E. B. Medoff
Victor Kopperman — T. C. McCarthy

KOPPERS COMPANY, INC. (621)
METAL PRODUCTS DIVISION
Baltimore 3, Md.

VICTOR J. KRIEG, INC. (S-72)
611 Broadway, New York, N. Y.
Will Display electric reciprocating saws. Power tools and accessories.
Representatives at Booth:
Victor J. Krieg — Wm. Lang
George Wolthoff — Harry Feldmann
Hedy Ziegenmeyer

LESLIE CO. (605)
Lyndhurst, New Jersey
Will Display pressure regulators, temperature regulators, pressure controllers, temperature controllers, liquid level controllers, pump pressure regulators, diaphragm control valves and control pilots.
Representatives at Booth:
J. S. Leslie — A. J. Dromm
R. W. Boettiger — H. A. Frederick
J. R. Bermingham

J. E. LONERGAN CO. (718)
211 Race Street, Philadelphia, Pa.
Will Display valves and gauges.
Representatives at Booth:
J. P. Cavanaugh — J. J. Kane
W. F. Braun — P. A. Rizon
J. P. McCool — A. F. Stumm
R. H. Davis — W. F. Brendlinger
P. V. Eckhart

LORD MANUFACTURING COMPANY (435)
1635 West 12th Street, Erie 6, Pa.
Will Display vibration and shock control mountings and bonded rubber parts.
Representatives at Booth:
C. L. Fred — V. J. Grumblatt
G. H. Billman — J. Anderson
R. E. Ricketts — V. Ellis
J. H. Morris — J. Weaver

LOVEJOY FLEXIBLE COUPLING CO. (548)
4949 W. Lake St., Chicago 44, Ill.
Will Display flexible shaft couplings, variable speed pulleys, universal joints and auto-tension motor base.
Representatives at Booth:
M. W. Dangel — C. P. Hennessy
Fred M. Allen

LUKENS STEEL CO. (139)
Coatesville, Pennsylvania
Will Display demonstration involving clad steel coal handling equipment.
Representatives at Booth:
H. Shepperd — D. J. Amole
F. H. Larson — J. H. Proctor
M. Wiechers

MAGNETROL, INC. (732)
2110 South Marshall Blvd.
Chicago 23, Illinois
Will Display boiler water level controls, liquid level controls for service on almost any liquid at any temperature or pressure.
Representatives at Booth:
Lester E. Stybr — R. J. Haupt
B. L. Binford

MANNING, MAXWELL & MOORE, INC. (521-525)
Stratford, Connecticut
Will Display safety valves, gauges, bronze and steel valves, electronic transmitters, thermometers, temperature regulators.
Representatives at Booth:
A. W. Coleman — E. M. Daderer
L. L. Edgren — R. F. Attner
K. W. Peterson — E. F. Nordstrom
M. S. Palmer — F. O. Eisenman
W. H. Bolin — G. E. Keating
L. E. Gebhart

MARTINDALE ELECTRIC COMPANY (S-66)
Box 617, Edgewater Branch
Cleveland 7, Ohio
Will Display motor and generator repair equipment, electric testing instrument, electric maintenance equipment.
Representatives at Booth:
R. E. Biersch — R. H. Martindale
E. H. Martindale — W. N. Osbun, Jr.
H. McFarland

MASON-NEILAN REGULATOR CO. (103)
1190 Adams St., Boston 24, Mass.
Will Display level controls, control valves, industrial instruments, pressure regulators.
Representatives at Booth:
F. K. Morrison — C. W. Wood
C. W. Gram — A. B. Powell
E. A. Bianchi — T. M. Nee
P. Wing, Jr. — W. F. Priest
R. O. Smith

MCGRAW-HILL PUBLISHING COMPANY (747 & 401)
330 West 42nd Street,
New York 36, New York

MECHANICAL HANDLING SYSTEMS (246)
4600 Nancy Ave., Detroit 12, Mich.

MELRATH SUPPLY & GASKET COMPANY, INC. (301)
Tioga and Memphis Streets
Philadelphia 34, Pennsylvania

THE MERCOID CORPORATION (434)
4201 W. Belmont Avenue
Chicago 41, Illinois
Will Display mercury switch equipped controls for pressure, temperature, liquid level for indoor, outdoor, and hazardous, locations.
Representatives at Booth:
J. W. Owens — W. K. Stauffer
I. E. McCabe — F. W. Ayer
H. Courteol — E. Sarson
R. F. Fisher — R. Martinsen
J. Shedden

METALLIZING COMPANY OF AMERICA (S-26)
431 East 75th Street
New York 21, New York
Will Display latest in Metallizing equipment as used for rebuilding worn machine units including turbines, shafting, pumps, and coal coppers.
Representatives at Booth:
V. A. Cook — Mark Gomperts
W. H. McMakin

METALOCK REPAIR SERVICE, INCORPORATED (132)
36-15 48th Avenue
Long Island City 1, New York

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY, INDUSTRIAL DIV. (533-535)
Wayne & Windrim Avenues
Philadelphia 44, Pennsylvania

MONROE TUBE COMPANY, INC. (S-25, S-27)
50 Church Street
New York 7, New York

MUNDET CORK CORPORATION (413)
7101 Tonnelle Avenue
North Bergen, New Jersey

NATIONAL AIROIL BURNER COMPANY (222)
1284 East Sedgley Avenue
Philadelphia 34, Pennsylvania

NATIONAL TUBE DIVISION UNITED STATES STEEL CORP. (431)
525 William Penn Place
Pittsburgh 30, Pa.
Will Display a wide variety of pressure, mechanical and stainless pipe and tubing and quality forgings.
Representatives at Booth:
A. C. Staley — T. E. Conklin
J. M. Birdsong — D. E. Hutchinson
G. W. Webster — J. W. Lindquist
W. J. Mahon

NATIONAL VALVE & MANUFACTURING CO. (335)
3101 Liberty Avenue
Pittsburgh 1, Pennsylvania
Will Display power and industrial piping counterpoise pipe hangers.
Representatives at Booth:
J. S. Land — H. E. Haller
William C. Foster — H. F. Huettner

NEUMANN & WELCHMAN, INC. (444)
22-12 Raphael Street
Fairlawn, New Jersey

NEW HERMES ENGRAVING MACH. CORP. (S-28 S-67)
13-19 University Place
New York 3, New York

THE NEW YORK AIR BRAKE COMPANY (702)
230 Park Ave., New York 17, N. Y.
Will Display vacuum and liquid handling pumps; hydraulic pumps, motors, valves, and actuating cylinders.
Representatives at booth:
W. Mills — J. Davis
G. W. Anderson — R. Jamieson
H. G. Saunders — R. Firth

NEWMAN INDUSTRIES, (AMERICA) INC. (631)
43 Broad St., New York 4, N. Y.
Will Display vertical hollow shaft motors, a new design of motor in new NEMA frames.
Representatives at Booth:
Mark Dash — Ray Fara
Jim Garry

NIAGARA BLOWER COMPANY (507)
405 Lexington Avenue
New York 17, New York
Will Display industrial air conditioning and heat transfer equipment.
Representatives at Booth:
N. L. Baker — A. C. Kniseley
B. M. Barnitz — R. C. Knight
Stanley Colter — R. H. Langer
E. H. Crawley — A. S. Leonard
O. F. Dahl — T. Y. Lorenz
D. B. Devendorf — Bruce Maguire
J. E. Douglas — R. M. Magner
H. U. Fisher — W. L. Offenhamer
O. F. Gilliam — M. H. Olstad
E. T. Gorbandt — Paul H. Schoepflin
J. S. Harford — S. O. Shashinka
Lawrence Holt — J. A. E. Steen
R. S. Jones — G. A. Stevens
Walter Kals — N. W. Ward

W. H. NICHOLSON & COMPANY (609)
12 Oregon St., Wilkes-Barre, Pa.
Will Display steam specialties — thermostatic-weight and expansion steam traps, multi-port valves stainless steel-monel-copper floats and two new products.
Representatives at Booth:
Donn Innes — B. W. Yocum
B. W. Yocum

OLIVER IRON & STEEL CORP., BERRY DIVISION (625)
Oliver Bldg., Pittsburgh 22, Pa.
Will Display hydraulic pumps, motors, transmissions and controls.
Representatives at Booth:
J. W. Wilcock — W. L. Denniston
C. R. Taylor — R. O. Mlady

ORR & SEMBOWER, INC. (400)
Reading, Pennsylvania
Will Display Powermaster packaged automatic boiler; Voriflow fuel burning systems; Auto-Loc electric boilers.
Representatives at Booth:
L. A. Roethe — R. C. Gray
W. P. Williams — A. J. Srynkiewicz
R. C. Currie — W. B. Firman
Jerry Darlington — S. D. Distelhorst

OWENS-CORNING FIBERGLASS CORP. (704)
National Bank Building
Toledo 1, Ohio

PACKARD-VAN RIPER CORP. (242)
34 Exchange Place
Jersey City, N. J.

PARKER APPLIANCE (710)
17325 Euclid Ave.
Cleveland 12, Ohio
Will Display tube fittings and tube working tools, hose fittings, hydraulic valves, and related units.
Representatives at Booth:
S. E. Voran — J. G. Watson
D. A. Cameron — W. D. Wynant
C. E. Klamm — P. Kozak
R. B. Jewett

PERFECTING SERVICE (440)
332 Atlande Ave., Charlotte, N. C.
Will Display Rotary Union, a rotating steam connection. Uni-Trap steam traps and Universal airline equipment.
Representatives at Booth:
A. J. DeMeyer — R. W. Rousch
Neil Sandman — L. A. Kaye

CHARLES C. PHELPS COMPANY, INC. (717)
700 New York Ave.,
Union City, N. J.

PHILADELPHIA GEAR WORKS, INC. (539)
G. Street below Erie Ave.
Philadelphia 34, Pa.
Will Display Limitorque, worm gear speed reducers.
Representatives at Booth:
R. S. Dobbs — J. Rewalt
R. Ball, Jr. — R. F. Irving
R. O. Frick — J. B. Mateer
H. L. Murray — C. W. Ludlow
M. C. Donze — R. J. Dale
C. S. Fischer — W. K. Kozel
R. W. Hoyt — F. Denham
P. B. Davies

PHILADELPHIA PUMP & MACHINERY CO. (205)
4946 Parkside Ave.
Philadelphia 31, Pa.
Will Display pneumatic Philatrol, new low-priced proportioning pump and new high pressure proportioning pump.
Representatives at Booth:
J. A. Eagan — J. J. Glackin
E. J. Ill — W. O. Schuman
E. N. Eagan

PHILLIPS DRILL CO. (S-68)
Michigan City, Indiana
Will Display self-drilling expansion shells (anchor bolts)
Representatives at Booth:
J. L. Campbell — B. Williams
J. J. Kerwin — T. F. Kelley
B. Bowman — J. M. Warnimont

PITTSBURGH CORNING CORP. (136)
One Gateway Center
Pittsburgh 22, Pa.
Will Display Foamglas insulation for piping, tanks and other equipment and for low temperature space insulation.
Representatives at Booth:
R. E. Buckley — J. A. Vasey

PLANT ENGINEERING (632)
110 S. Dearborn St.,
Chicago 3, Ill.
Will Display an industrial publication

PLIBRICO COMPANY (406)
1800 Kingsbury St., Chicago 14, Ill.
Will Display Portable Incinerator and Inspecto Base.
Representatives at Booth:
I. S. Pieters, — R. Curran
T. J. Barry — H. C. Smith
H. J. Reis — R. H. Wilder
J. A. O'Brien

H. W. PORTER & CO. (217)
217 825 Frelinghuysen Ave.
Newark 5, N. J.
Will Display Therm-o-tile, conduit for underground piping.
Representatives at Booth:
R. J. Sachs — T. H. Hawkins
W. H. Morris — A. C. Carlson
C. W. Haltermann — S. F. Stallings
S. J. Byrnes — W. Cunningham
T. O. Mannell — A. C. Kantmann
F. T. Rau — D. Wallace, Jr.

POWER (401)
330 W. 42nd St.,
New York 36, N. Y.
Will Display a publication in the power field.

POWER ENGINEERING (632)
110 S. Dearborn St.
Chicago 3, Ill.
Will Display a publication in the power field.

% PROPORTIONEERS, INC. % (204)

345 Harris Ave., Providence, R. I.
Will Display a continuous automatic fuel blender which will take $6 and $2 fuel and continuously blend them to a $5 product for burner consumption. New metering pump.
Representatives at Booth:
R. M. Gwynne — J. W. Westfall
P. V. Crowther — E. B. Lynch
F. W. Deutsch — R. P. Lowe
R. W. Pearce — R. H. Glanville

R & R COMPANY (236)

Box 77, Sharon Hill, Pa.
Will Display Vis-A-Plug, a visible means of testing steam traps.
Representatives at Booth:
H. Webb — G. E. Hill
C. Fisher — V. Rainsford
W. F. Anderson — R. R. Rhinehart

RADIO CORP. OF AMERICA ENGINEERING PRODUCTS DIVISION (518)

Camden, New Jersey
Will Display latest developments closed-circuit television for power plants, including water-cooled lens for observing combustion conditions.
Representatives at Booth:
W. P. Davidson — R. I. Gary
E. J. Guiltoy — A. R. Walthers
C. H. Troth — G. B. Russell
H. B. Merrill

RAPID ELECTRIC CO. (322)

2881 Middletown Rd., New York 6, N. Y.
Will Display various models a-c power supplies featuring Magnatrol, latest magnetic amplifier control, new Germanium rectifier unit.
Representatives at Booth:
J. Viola — P. Bruno
Wm. E. Bryan — F. La Mantia
S. Chait

RAYBESTOS-MANHATTAN, INC., PACKING DIV. (607)

Manheim, Pa.
Will Display Big 7 packings.
Representatives at Booth:
R. B. Hazard — Wm. Krucke
B. W. Thomas — G. E. Horvath

REEVES PULLEY CO. (410)

1225 Seventh St., Columbus, Ind.
Will Display complete line of variable speed drives and controls, all in operation. New design featured.
Representatives at Booth:
I. V. Falk — Carl Brassler
P. C. Talbot — J. H. Gepfert
John Mahoney — R. D. Moore
Jack McClelland

REPUBLIC MFG. CO. (340)

1930 W. 77th St., Cleveland 2, Ohio

REPUBLIC STEEL CORP. STEEL & TUBES DIV. (113)

224 E. 131st St., Cleveland 8, Ohio
Will Display Electrunite boiler, heat exchanger, and condenser tubing; stainless steel tubing and pipe; carbon and stainless steel mechanical tubing. Electrunite E.M.T. and corrosion resistant conduits. Rigid steel conduit.
Representatives at Booth:
J. A. Ireland — W. I. Reiner
J. J. I. Jamieson — C. J. Boyd
E. H. Wardle — C. F. Jensen

RESEARCH CORP. (107)

Bound Brook, N. J.
Will Display equipment demonstrating use of Cottrell electrical precipitators in industry—includes working model precipitator.
Representatives at Booth:
H. N. Pier — D. Salvatore
S. E. Specht — E. G. Lassen
R. A. Renwanz

REVCO INC. (639)

2 E. Franklin Ave., Minneapolis 4, Minn.
Will Display variable speed transmissions.
Representatives at Booth:
Richard G. Gray — Richard Hersey

J. E. RHOADS & SON (748)

35 N. Sixth St., Philadelphia 6, Pa.
Will Display "Timing" belt drive.
Representatives at Booth:
R. H. Rhoads — J. H. Miller
C. H. Tildas — E. Evans
S. L. Allen — J. Conrad
H. H. Conrad

C. H. RIBBLE CO. (624-626-628)

261 Broadway, New York 7, N. Y.
Will Display Furnas Electric Co. motor control, Richardson Control Systems control panels.
Representatives at Booth:
C. H. Ribble — Fred Lawrence
M. G. Saake — J. Lisenby
H. O. Meyer — Howard Jones
F. Ieradi — F. Unbehaun
P. Schellenberg

RICHARDSON CONTROL SYSTEMS (624)

Clifton, N. J.

THE RIC-WIL COMPANY (705)

24 Brown St., Barberton, Ohio
Will Display prefabricated insulated conduits for underground and overhead piping.
Representatives at Booth:
H. S. Boring — C. G. Van Schoor
E. R. Benedict — R. J. Ruschell
N. L. Mooneyham — L. T. Burrough
W. F. Wood — W. H. Lukens
E. S. Pandy

RIDGE TOOL COMPANY (S-46, S-85)

Elyria, Ohio

JOHN R. ROBINSON, INC. (427)

38-05 30th St., Long Island City, N. Y.
Will Display Steelbestos gaskets—Robinson's combination condenser cleaning gun and brushes — vibro gauge snubbers — gasket cutters — Stuard air separators.
Representatives at Booth:
F. W. Robinson — E. Miller
J. R. Cave — F. Cunningham
R. Peterson

ROCKWOOD PULLEY MFG. CO. (124)

20 Crosby St., New York, N. Y.

ROCKWOOD SPRINKLER CO. (218)

38 Harlow St., Worcester 5, Mass.

ROY E. ROTH CO. (307)

2420 Fourth Ave., Rock Island, Ill.
Will Display regenerative turbine pumps.
Representatives at Booth:
R. E. Roth — N. F. Dahm
P. M. Roth — E. Kasenberg
A. E. Read

ROTHERM ENGINEERING CO., INC. (316)

7280 W. Devon Ave., Chicago 31, Ill.
Will Display revolving joints for steam, air, and hydraulic pressures featuring demonstrating models of these joints that will compensate for roll eccentricity.
Representatives at Booth:
H. S. Kuhn — R. E. Mack
E. J. Montalvo — A. A. Bacher
J. N. Kelleher — R. H. Merwin

S & S MACHINERY COMPANY (S-112)

140 53rd St., Brooklyn, New York
Will Display machine tools featuring automatic cycle single point threading machine.
Representatives at Booth:
Steve Allen — Jay Srybnik
L. D. Srybnik — Herb Spencer
A. J. Schirmer — Ralph Claser
Simon Srybnik — Pete Bernardo

HENRY E. SANSON & SONS, INC. (445)

2215 N. American Street, Philadelphia 33, Pennsylvania
Will Display Syn-Solv, fuel oil addi-Powder'd oils for grinding and cutting; No-Drip lubricating oils and greases; C.T.T.D. tapping and threading compound.
Representatives at Booth:
Henry E. Sanson — Milton Teich
H. E. Sanson III — J. D. Ney
Edward J. Sanson — B. T. Bishop
Samuel Petrosky — H. H. High
J. A. Perkins — H. J. Scheer
Harry E. Bell — W. W. Wentz
E. D. Winans

SARCO COMPANY, INC. (534)

Empire State Building, New York 1, New York
Will Display five different types of steam traps. Also self-powered and electric temperature controllers, heating specialties, air vents, and strainers.
Representatives at Booth:
A. Milnes — F. G. Watkins, Jr.
M. J. Marion — W. Andrews
D. Roland — J. Andrews
J. Thompson — R. Greene
F. C. Perkins — K. Abrahamson
M. Biggs — D. Mariner

FRED H. SCHAUB ENGINEERING CO. (248)

2110 South Marshall Blvd., Chicago, Illinois
Will Display zero-oxygen deaerator, boiler feed pumps and controls, process machine drainage.
Representatives at Booth:
Fred H. Schaub — G. W. Gale
E. S. Nelson — T. C. McCarthy
R. D. McDonald

A. SCHRADER'S SONS DIVISION OF SCOVIL MANUFACTURING CO., INC. (S-37, S-41)

470 Vanderbilt Avenue, Brooklyn 38, New York
1600 Hamilton Street, Philadelphia, Pennsylvania
Representatives at Booth:
F. L. Engstrom — S. LeCount
F. H. Churchwell — E. J. Schan
J. J. Meister — A. F. O'Toole
B. J. Rinklin

SELLERS INJECTOR (616)

1600 Hamilton St., Philadelphia, Pa.
Will Display heavy duty cleaning equipment and Haines steam traps.
Representatives at booth:
V. F. Sheronas — William Sellers
I. P. Pedrick — R. A. Reitz
T. Haering

SHELL OIL COMPANY (407)

50 West 50 St., New York, N. Y.
Will Display industrial lubricants, Tellus oils, hydraulic power, Alvania grease—a multi-purpose grease.
Representatives at Booth:
R. M. Colinda — L. W. Catling
W. H. Neidermaier — B. J. Davis
C. Mead — J. G. Gilmore
C. R. Skord — D. Shaw
C. E. Brown — E. Hornick
E. A. Martin — T. J. Klement

SIER-BATH GEAR & PUMP CO. (109)

9252 Hudson Blvd., North Bergen, N. J.
Will Display precision gears, rotary pumps, and gear type flexible couplings.

SIMS PUMP VALVE COMPANY, INC. (618)

1314 Park Avenue, Hoboken, N. J.
Will Display a reciprocating pump with a Plexiglass face showing inclined port rotating pump valves in operation.
Representatives at Booth:
A. W. Sims — E. Carstens
R. L. Fischer — E. F. Zeiner
R. Relay — G. C. Stephens
T. Krauss — L. H. Point
V. Lumia — W. J. Pilkington

SMITH & SERRELL (328)

200 Washington Street, Newark 2, New Jersey
Will Display flexible shaft couplings, fast action automatic "C" clamps.

SOUTH BEND LATHE WORKS (S-111)

South Bend 22, Indiana

SOUTHERN POWER AND INDUSTRY (306)

806 Peachtree Street, N. E. Atlanta 5, Georgia
Will Display an industrial publication.

SPARLING METER CO., INC. (617)

Box 3277, Los Angeles 54, Calif.
Will Display main-line water control equipment — meters, indicators, recorders and controls for chemical feed.
Representatives at Booth:
H. L. Edwards — J. P. O'Brien
R. Smith

SPECIALTY ENGINEERING CO. (743)

Torresdale Ave. & Pennypack St. Philadelphia 36, Pennsylvania

SPENCE ENGINEERING COMPANY, INC. (701)

29-41 Grant Street, Walden, N.Y.
Will Display pressure and temperature regulators and a VuGraph to sketch recommendations to control problems.
Representatives at Booth:
Paulsen Spence — Charles V. Peck
Robert H. Brock — John J. Carey
Ernest Grafe — C. W. Juers
W. L. Small

SPENCER TURBINE COMPANY (620-622)

486 New York Ave., Hartford, Conn.
Will Display portable and stationary heavy duty vacuum cleaners and turbo-compressors.
Representatives at Booth:
R. A. Brackett — F. Flood
N. S. Barnes — R. Graff
A. B. Bates — R. Webber
I. Geiger — H. A. White

HENRY A. SPITTLER, INC. (S-25, S-27)

50 Church St., New York 7, N. Y.

SQUARE D COMPANY (108)

6060 Rivard St., Detroit 11, Mich.
Will Display electrical distribution and control equipment.
Representatives at Booth:
A. H. Kranzush — W. Younger
E. Love — M. Kartalia
R. E. King — S. C. Hunt
R. L. Chandler — O. M. Cavallo
W. Helle

THE C. E. SQUIRES COMPANY (330)

18502 Syracuse Avenue, Cleveland 10, Ohio
Will Display high and low pressure reducing valves, traps, pump governors, boiler feed water controllers. Temperature regulators, combination pressure and temperature valves.
Representatives at Booth:
J. P. AuWerter — H. G. Brown
W. L. Bartel

STAR EXPANSION BOLT COMPANY (636)

147 Cedar St. New York 6, N.Y.
Will Display anchoring and drilling devices for masonry and hollow walls.
Representatives at Booth:
H. J. Wilhelm — H. Fox
M. G. Hayden — E. J. Wilson
A. Asante

STEAMASTER AUTOMATIC BOILER COMPANY (247)

5819 Compton Avenue, Los Angeles 11, California

STEPHENS-ADAMSON MFG. CO. (734)
Aurora, Illinois
Will Display non-clogging coal crusher, car puller, bin level control.
Representatives at Booth:
R. B. Carr — E. V. Drake
S. C. Johnson — C. F. Giermak
W. E. Williams — R. G. Zilly

STOW MANUFACTURING CO. (140)
443 State St., Binghamton, N. Y.
Will Display flexible shaft drives, geared joints.
Representatives at Booth:
C. Hotchkiss, Jr. — G. H. Karian
J. L. Dickinson — C. P. Smith

STRACHAN-MACKOE CORP. (731)
90 West St., New York 6, N. Y.
Will Display Wright-Austin steam separators, traps, and exhaust heads. Yorkshire Copper Works tubing, heat exchangers, and condenser tubes.
Representatives at Booth:
D. G. Warmer — T. C. Ingle
J. R. Stager — C. Strachan
A. C. Schwartz — G. J. Koechlein

STRONG CARLISLE & HAMMOND COMPANY (202)
1392 West Third Street
Cleveland 13, Ohio
Will Display steam traps, reducing valves, strainers, separators and miscellaneous steam specialties.
Representatives at Booth:
R. L. Clark — O. F. Sutliff
H. H. Maltbie — C. W. Mann

SUMCO ENGINEERING CO. (709)
P. O. Box 193, Caldwell, N. J.
Will Display chemical cleaning services and industrial solvents.
Representatives at Booth:
S. M. Rose — E. W. Murray
S. M. Summ

SUPERIOR COMBUSTION INDUSTRIES, INC. (133)
Times Tower, Times Square
New York 36, N. Y.
Will Display 100 hp steam generator. Superior Rotary burners for oil, gas, or combination.
Representatives at Booth:
J. P. Meizer — J. Fickes
G. E. De Siena — W. H. Wild
F. P. Hohnhold — Jack Sklaar

THE SUPERIOR ELECTRIC CO. (313)
83 Laurel Street, Bristol, Conn.
Will Display a representative line of voltage control apparatus.
Representatives at Booth:
J. S. Louden — Frank Molander
C. Downey — J. Valley
B. O. Deming — R. Hampson
B. Link — D. Calloway

SWIVELIER COMPANY, INC. (739 & 741)
43 34th St., Brooklyn 32, N. Y.
Will Display universally adjustable DEXTRA-LITES.
Representatives at Booth:
H. C. Brandman — A. Hopkin
J. V. Marcus — B. Hopkin
I. Newman — M. Davis
S. Rosaler — L. Winters
J. Ellis — G. Rhawn
J. Logan

TALLER & COOPER, INC. (448)
75 Front St., Brooklyn 1, N. Y.
Will Display automatic annunciators, gas analyses equipment, and digital converters.
Representatives at Booth:
B. Cooper — A. Stern
B. J. Jacobson — L. Gise
M. D. Weiss — S. Kroll
A. Rifkin — M. Schwartz
S. A. Radler — H. Winer
R. Goodman — C. G. McKenna

TECHNICAL PUB. CO. (632)
110 S. Dearborn St.
Chicago 3, Ill.

TEMP 'O' CRETE INTERNATIONAL CORP. (348)
1133 E. 25th Street
Brooklyn, New York
Will Display underground conduits for heat distribution in central systems.
Representatives at Booth:
E. V. Beltran — A. Mercado
R. Beltran — T. Loquidice

THE TEXAS COMPANY (418)
135 East 42nd Street
New York 17, New York

THOMAS FLEXIBLE COUPLING CO. (721)
Main Avenue & Biddle Street
Warren, Pennsylvania
Will Display all-metal flexible couplings for power transmission shafts.
Representatives at Booth:
F. L. Donovan — E. Hagenlocher
W. H. Potter — Leo Cross
Wayne Campbell

TOLEDO PIPE THREADING MACHINE CO. (S-23)
1446 Summit St., Toledo 4, Ohio
Will Display pipe tool equipment, power pipe machines, pipe wrenches, etc.
Representatives at Booth:
H. F. McClellan — W. L. Gahman
C. A. Martus

H. O. TRERICE COMPANY (638-640)
1420 W. Lafayette Blvd.
Detroit 16, Michigan

TROY ENGINE & MACHINE CO. (604)
1492 Railroad Avenue
Troy, Pennsylvania
Will Display type "EN" governor for steam engines and steam driven compressors.
Representatives at Booth:
J. L. Parson — R. S. Stuckless
A. A. Prior — H. F. Herrington

U. S. ELECTRICAL MOTORS INC. (331)
200 E. Slauson Ave.
Los Angeles 54, California
Will Display Varitrol, a new automatic control for Veridrive variable speed motors; Type H. Uniclosed Motor, new line of general purpose, horizontal motors with NEMA rerated standards and dimensions. Veridrive, variable speed motors; Syncregear, internally geared motors (helical); Uniclosed, general purpose horizontal motors; Type GW Syncregear, right angle, worm gear motors.
Representatives at Booth:
R. G. Liebmann — W. M. Johnson
J. W. Sullivan — R. M. Bowman
H. L. Proppe — J. C. Tyma
B. E. Griffin — J. F. Devine
J. C. Ash — E. C. Horbeck

U. S. STEEL CORP. (431)
525 William Penn Place
Pittsburgh 30, Pa.

VAPOR HEATING CORP. (214)
80 E. Jackson Blvd.
Chicago 4, Ill.
Will Display automatic steam generators, relays, thermostats.
Representatives at Booth:
L. R. Davis — G. C. Scott
Vern Coon — W. Farley
F. E. Hess

VELAN ENGINEERING (210)
414 Darby Road, Havertown, Pa.
Will Display universal steam traps.
Representatives at Booth:
Pat Cox — A. K. Velan
Jack Hartmann — Don Tomalty

VICKERS, INC. VICKERS ELECTRIC DIV. (408)
1815 Locust St., St. Louis 3, Mo.
Will Display new Controlarc magnetic-amplifier-selenium rectifier arc welder; Magneclutch magnetic-particle clutches; new high-ambient temperature, high-voltage selenium rectifier.
Representatives at Booth:
F. G. Logan — R. C. Quade
J. H. Garwood — C. M. Burnett
N. C. Cummings — Harry A. Pappas

HENRY VOGT MACHINE CO. (501)
1000 W. Ormsby St.
Louisville 10, Ky.
Will Display drop forged steel valves and fittings; a sectionalized heat exchanger; scraped surface chiller.
Representatives at Booth:
W. S. Cannon, Jr. — F. M. Kepler
W. A. Jackman — R. F. Woolf
Harry Ernst

VOSS CO., INC., J. H. H. (302)
785 E. 144th St., N. Y. 54, N. Y.
Will Display compressor valves and discs.
Representatives at Booth:
Karl Schartel — Mrs. Alice C. Voss
Albert Pereiman

JOHN WALDRON CORP. (735)
P. O. Box 791,
New Brunswick, N. J.
Will Display flexible pin and gear type couplings; automatic overload cut-out coupling.
Representatives at Booth:
H. A. Anderson — W. H. Munn
W. M. Bevis — E. M. Di Napoli
R. Eadie

WALLACE & TIERNAN CO., INC. (309)
25 Main St., Belleville, N. J.
Will Display new Type A-703 chlorinator, and an improved design of the Massometer.
Representatives at Booth:
R. B. Martin — S. Cole
L. Demler — W. Taylor
E. U. Irish — R. Hancock
R. B. Mowry

WARD LEONARD ELECTRIC CO. (423)
115 MacQuesten Parkway South
Mt. Vernon, N. Y.
Will Display electric control devices; contactors, starters, rheostats, relays, and resistors.
Representatives at Booth:
E. F. Becker — J. E. Reagan
F. E. Beede — R. C. Ridout
J. A. Kebler — W. C. Schofield
S. E. McClure — E. Slivinsky
J. Vetter

WATSON-STILLMAN FITTINGS DIV. H.K. PORTER CO., INC. (300)
P. O. Box 95, Roselle, N. J.
Will Display forged steel fittings.
Representatives at Booth:
J. Kemper — W. Reinhardt
J. Tough — W. Wear
J. Ocello — D. Wroten
C. Liberg — B. Dickert
A. Johnson — A. Trainor
T. T. Thompson, Jr.

WESTINGHOUSE ELECTRIC CORP. (414)
33 Gateway Center
Pittsburgh 30, Pa.
Will Display atomic power plant model, 5000 & 15,000 kw gas turbine model, geared steam turbine, Life-Line "A" motor.
Representatives at Booth:
C. L. Mauntel — C. V. Roseberry
D. R. Jenkins — A. J. Danni
R. C. Twombly — P. J. Bridwell
K. M. Patterson

WETZLER CLAMP CO. (S-35)
43-15 11th St.
Long Island City 1, N. Y.
Will Display clamps and clamping devices.
Representatives at Booth:
H. J. Wetzler — D. J. O'Hea
E. J. Sauerbrey

C. H. WHEELER MFG. CO. (201)
19 & Lehigh Ave.
Philadelphia, Pa.
Will Display Wheeler reverse flow condensers and scale working model; condenser auxiliaries, including vertical and horizontal condensate pumps and air ejectors.
Representatives at Booth:
F. L. Yetter — P. J. Hamm
E. E. Baker — H. A. Schrader
B. P. Hillman — G. W. Conn

THE GUSTAV WIEDEKE CO. (437)
1833-1901 Richard St.
Dayton 1, Ohio
Will Display new package boiler tube expanders; modern water tube boiler tube expanders; new condenser tube expanders; tube expander accessories.
Representatives at Booth:
Roy B. Pleiman — Norman Weber

WATERTOWN DIV. THE NEW YORK AIR BRAKE CO. (702)
(See New York Air Brake Co.)

L. J. WING MFG. CO. (200)
Linden, New Jersey
Will Display improved design draft inducers for heating and power boilers; forced draft blowers; revolving unit heaters.
Representatives at Booth:
H. S. Wheller — A. T. Babel
C. H. Smith — G. M. Comstock
T. R. Peyrek — R. J. McCrory
George Nash — R. J. Purcell
R. O. Teller — R. P. Stebbins
W. J. Matiez — J. P. McKiernan
T. R. Harden — A. B. Shepherd
E. H. Hubert — A. T. Shepherd
D. H. Skinner — John C. Malkmus
W. Park Terry — Wm. A. Milby
W. E. Hagaman — Geo. S. Garrett
C. C. Brownley — Irvin H. Geiger
Wm. C. Mclain — John Hessey

WRIGHT AUSTIN CO. (731)
3245 Wight St., Detroit 7, Mich.
Will Display new models of moisture separators, steam traps, and boiler trim.
Representatives at Booth:
T. C. Ingle — C. Strachan
Wm. E. Dennis — A. C. Schwartz
Geo. Koechlein — D. G. Warmer

YARNALL-WARING CO. (513-517)
Chestnut Hill, Philadelphia 18, Pa.
Will Display blow-off valves, drain valves, water gages, water level indicators and recorders for boiler room service, steam traps and strainers, expansion joints, and digester blow valves.
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J. A. Steer — R. W. Catlin
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YORKSHIRE COPPER WORKS (731)
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Erie, Pa.
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F. J. Barr — Harold Bergman
Carl Hayden — C. C. Lowry
Ken Hayden — Less Campbell

What it takes to make a 3000 Degree Refractory Concrete

Because of the widespread interest in the use of refractory castables, many furnace operators have asked us for the story behind the performance of B&W's unique refractory concrete, Kaocast.

Here are the answers to some of the most frequently asked questions:

Q. *When you refer to Kaocast as a 3000 degree refractory castable, do you mean that its melting point is 3000° F?*

A. No, this means that its service use limit is 3000° F; its melting point is 200 degrees higher.

Q. *Just what does it take to make a 3000 degree refractory castable like B&W Kaocast?*

A. Let's first define a few terms. Refractory castables are made with granular materials which are volume stable at high temperatures and which can undergo repeated heating and cooling cycles without disintegration. These materials, known as refractory calcines or grogs, are blended with suitable hydraulic binders. The initial strength of a refractory castable is thus developed in the same manner as that of ordinary concrete—that is, through the chemical action between water and the binder. A strong *ceramic bond* is formed when the refractory castable is subjected to temperatures above the vitrification point.

Q. *Then you have a grog, a binder and a method of putting them together. Which is most important?*

A. You can't say that any *one* is most important. It's a combination of all three. Let's take them one at a time. Our grog consists primarily of the proper blend of kaolin and other alumina-silica materials. This ratio enables us to achieve a grog with minimum expansion and shrinkage, a high fusion point, and greater stability under load, at varying temperatures.

Q. *And now, what about the binder?*

A. There are a number of factors responsible for the success of the Kaocast binder. One is the compound Tricalcium Penta-aluminate (3 lime to 5 alumina). This formula produces the most refractory compound (highest melting point) that can be made from lime and alumina. Another is that by using the purest commercially available lime and alumina, the Kaocast binder is substantially free of iron and silica. Such traces of these that are present combine during the prefiring of the binder to produce stable compounds.

Q. *Just how important is the manufacturing or "blending" of the grog and the binder?*

A. If one factor could be singled out as "most important" it would be quality control.

Direct control over the fineness of materials, prefiring temperatures, and other phases of manufacture is possible at B&W because both the grog and the binder are made and blended at B&W's Augusta Works—under B&W's direct control and supervision.

Q. *These factors you've discussed must add up to some specific advantages of Kaocast. What are they?*

A. B&W Kaocast has all the advantages of easy installation which are responsible for the widespread interest in refractory concretes, plus these exclusive features: It is the only 3000 degree refractory concrete with high resistance to spalling and low volume change throughout its operating range.

THE BABCOCK & WILCOX CO.
Refractories Division
General Offices:
161 East 42nd St., New York 17, N. Y.
Works: Augusta, Ga.

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ideas in action

. . . in U. S. industrial plants

Plant's Materials Handling System Designed by Engineering Departments

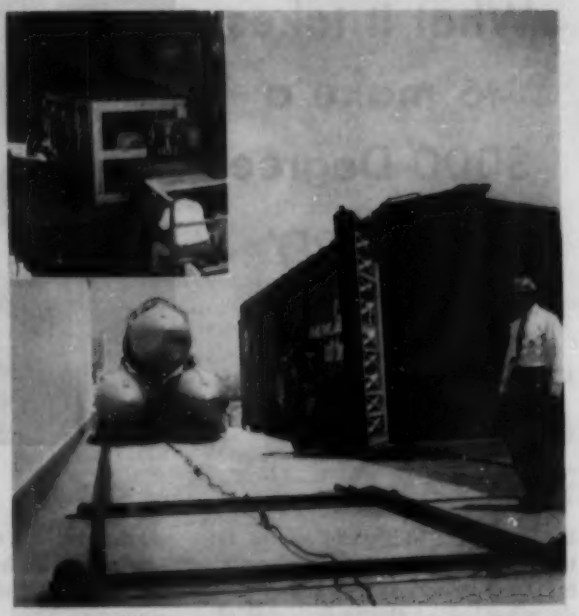
Putting space, tools, and manpower to the highest economic use depends in part on efficient materials handling. Plants, such as Ryan Aeronautical Co., San Diego, Calif., which turns out products of basically different types, may, lacking planning, end up with a veritable Rube Goldberg system.

At Ryan, the Methods and Plant Engineering Departments cooperated in the design and fabrication of tailor-made conveyor, loading, and carrying devices.

For instance, in the production of Pratt and Whitney Aircraft exhaust systems, each system is composed of seven large sections slightly different in design but similar in appearance. The sections are too big to be handled easily or to be placed on a conveyor belt. To prevent misrouting of similar parts and to maintain balanced production, engineers laid out four contiguous areas, each circled with floor tracks and served with mobile parts dollies. Special racks are located at strategic points and both racks and dollies are keyed to the various production machines.

Racks made of welded steel frames with padded separators fit specific parts and are equipped with large wheels for easy movement. Tote carts had been used to carry parts from one department to another, but only a few of the larger and bulkier parts would fit in a cart and some had to be placed on top of the cart—overhanging each side.

An ingenious system of loading railroad boxcars with huge external wing fuel tanks was also developed. Formerly, only two crated tanks could be shipped per boxcar. Sante Fe Railway set aside eleven cars that had been built extra long, high, and wide for aircraft parts during World War II. Again, special racks were built, each consisting of three rubber-lined cradles to support the tanks in triangular formation. Rails on



Upper left, with old method two tanks were loaded per boxcar; large picture shows special racks now in use.

which the racks could move were installed inside each of the cars and on docks and ramp from which racks are loaded. At the loading dock the shipping rack slides off its transporting dollie. Grooved casters on the rack pick up an inverted angle rail on which it is pulled up the ramp by cable. From the dock, the racks again move forward on inverted angle rails leading into the box car. With this system, six tanks can be shipped in one car.

Built-in Vibration Damper Extends Operating Range of Boring Bars

You don't have to be a Sherlock Holmes to find and cure one of the two major causes of inaccuracies in precision boring operation — vibration self-excited by the boring bar itself. However, the second type of vibration, that which comes from heavy machines relatively close to a precision boring machine, may require considerable detective work to determine the machine causing the trouble. Engineers of the Carboloy Dept. of General Electric Co., while investigating self-excited vibrations, developed a simple technique for damping.

Normally, a rotating type boring bar requires considerable attention be given to its running balance. Since rotating bars commonly incorporate an adjustment for size control in their mounting flange, the amount of tool bit adjustment off center is slight (usually not over 0.0005 in. either way) and therefore is not enough to induce vibrations that would affect tool life. Stationary bars need no consideration for balance.

A solid steel bar can be used safely when the hole to be bored does not exceed the ratio of 4:1. That is, its normal maximum length is four times its diameter.

The self-excited vibration of a steel bar having a carbide stiffening core is dependent on the bar diameter, and its effect on core diameter-to-length ratio. It is impossible, therefore, to state its definite range of use.

Solid carbide bars are being used successfully on work parts where length-to-diameter ratios exceed those normally machined with steel bars.

Normal operating range of these steel or carbide bars can be extended through the use of built-in vibration dampers. The damper can be either a piece of tungsten carbide or Hevimet (high tungsten alloy twice as heavy as lead) weight that "floats" in a prepared cavity located as near to the outer end of the bar as possible. Slight clearance is provided around the

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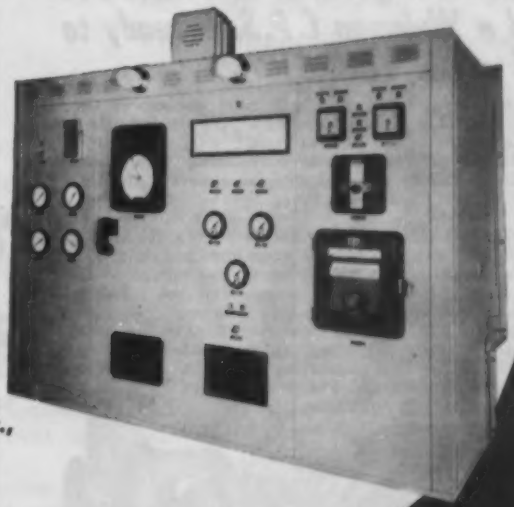

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ideas in action

—Starts on page 92

weight to provide an air film. The effect of this loose weight is to dampen out vibrations induced by the tool itself while cutting.

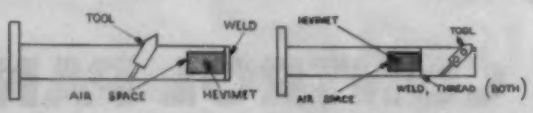
Applying these weights can be done two ways—both fairly simple techniques.

In both methods, the Hevimet slug used should be as large in diameter as the bar will take. For example, use a ¾-in. diameter Hevimet piece in 1-in. boring bars.

The ratio of diameter of the Hevimet piece to its length should be 1:2.

It is a good idea to allow a 0.003-in. "float," or air space, between the ground outside diameter of the Hevimet slug, and the ground inside diameter of the hole in the boring bar. The "float" in relationship to the length of the Hevimet piece and the depth of the hole in the boring bar should be 0.010 in.

According to Carboloy engineers, it is easiest and best to position the slug in front of the tool. This can be



Left, weight in front of tool; right, weight in back of tool with the portion holding tool acting as cap.

done by drilling a hole in the end of the boring bar, inserting the Hevimet slug, and brazing a cap on the end of the bar.

However, when boring a blind hole, a cartridge arrangement must be used. In this method, the Hevimet slug is positioned behind the tool in the same position as in the previous method. The cartridge containing the tool is then brazed to the bar to serve as the cap for the Hevimet piece.

Both methods of applying weights work as well with bar rotating, or with bar stationary and work rotating.

Amendment Recommended for National Electrical Code

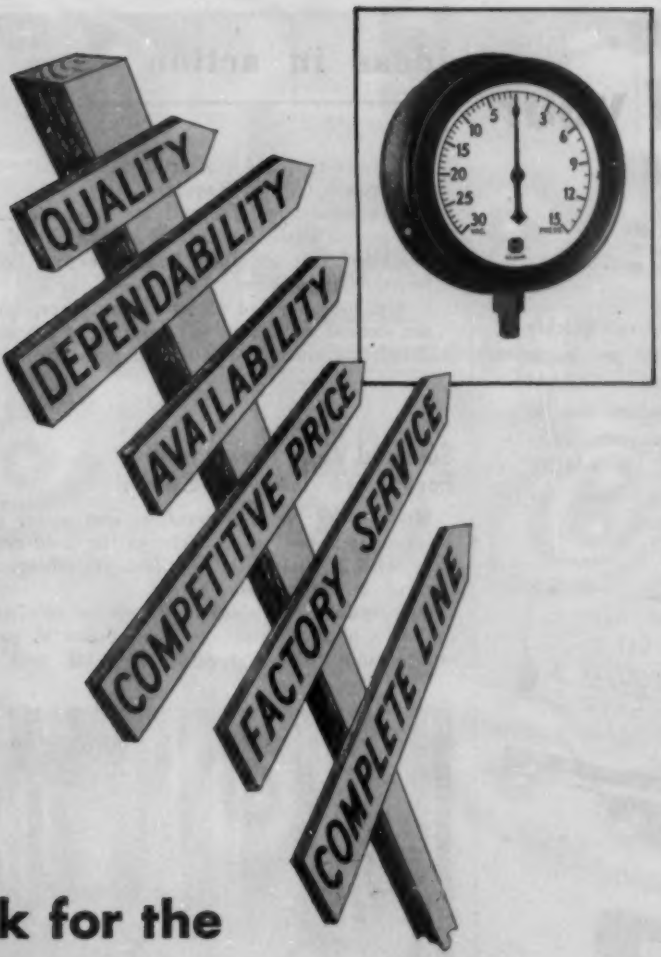
Recognizing the advances in the manufacturing, use, and installation of unit air-conditioning equipment, the National Electrical Code Committee of the National Fire Protection Association has recommended the addition of the following amendment to the 1954 printing of the National Electrical Code to be effective as of January 1, 1955.

Provisions for Air-Conditioning Units

4291. General. The provisions of this section shall apply to electrically energized units and equipment which control temperature and humidity.

4292. Grounding. Exposed non-current-carrying metal parts which are liable to become energized shall be grounded under one or more of the following conditions:

1. if permanently connected to metal-clad wiring;
2. if in a wet location and not isolated;
3. if within reach of a person standing on the ground outside of a building;
4. if in a hazardous location, see Article 500;
5. if in electrical contact with metal or metal lath;



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Over and above mechanical features—*quality* . . . assurance of sustained high accuracy . . . long, trouble-free service . . . are most important. But, availability and price are also important.

When you buy USG gauges, you're assured guaranteed satisfaction in enduring accuracy, performance, dependability and price. For over 50 years, USG gauges have been renowned for their high accuracy and dependability—more original equipment manufacturers specify USG than any other make.

USG stocks for your convenience over 200,000 standard gauges of all types. See your USG Distributor for all your gauge requirements. More than likely, he can supply you with any quantity of gauges you want for any application, directly from his stock.

UNITED STATES GAUGE USG

Gauge Headquarters for over 50 years

United States Gauge, Division of American Machine and Metals, Inc., Sellersville, Penna.

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Quality, accuracy, immediate availability, price—these are important factors in gauge buying.

Equally important, however, is assurance that gauges will perform with lasting dependability. USG provides that assurance by testing under simulated operating conditions in its Research Laboratory. Annually, these USG tests save customers hundreds of thousands of dollars in superior operating performance and less down time, not to mention eliminating more frequent gauge replacements.

Constant testing of materials under all kinds of operating conditions and pressures is one of the many reasons why USG gauges are renowned for their enduring accuracy and dependability. USG assures this accuracy and dependability in lot after lot by employing in its manufacture the most rigid quality control system in the instrument industry.

Higher quality gauges at competitive prices are made possible by USG because its facilities are economically integrated for large volume quality-controlled production. It provides further savings to industry by stocking the world's largest, most complete line of gauge components to meet practically any pressure sensing and indicating need. From these components USG engineers often make special gauge designs, at practically stock costs, to meet individual operating conditions.

Gauge for gauge—in every application classification—*in every price class*—USG has more to offer than any other make gauge.

Above, a portion of USG's Research Laboratory. Here constant testing of materials under customer operating conditions assures optimum efficiency and long gauge life.

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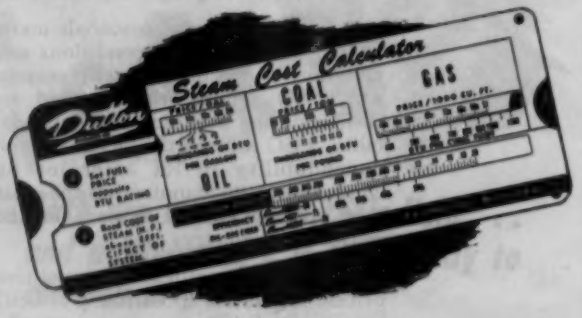
Whether you burn coal, oil or gas you can quickly and easily determine your steam cost per horse power with this handy, pocket-size Dutton STEAM COST CALCULATOR. It also enables you to check the efficiency and fuel cost of your boiler with those of Dutton EconoTHERM, EconoMIST and EconoMIZER package Boilers – famous for efficiency, long life, low operating costs.



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ideas in action

—Starts on page 92

6. if more than 150 v to ground.

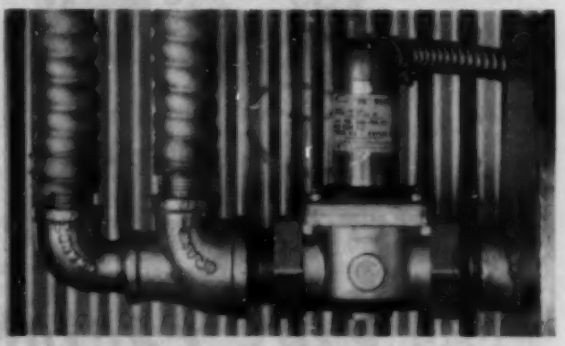
4293. Branch Circuit Requirements.

1. The total load of motor operated air-conditioning equipment shall not exceed 80 percent of the rating of a branch circuit which does not supply lighting units or other appliances;
2. The total load of air-conditioning equipment shall not exceed 50 percent of the rating of a branch circuit if lighting units or other appliances are also supplied.

Solenoid Valve Proves Itself For Precise Fluid-Flow Control

Modern heating, refrigeration, and power generation equipment is only as efficient as the fluid-flow devices used with it. One of the simplest, yet efficient means of control, is the solenoid valve.

One midwestern plant has installed two such valves on each of its vacuum storage tanks to provide instantaneous release, positive shut-off, and minimum



Solenoid valves permit continuous automatic cycling.

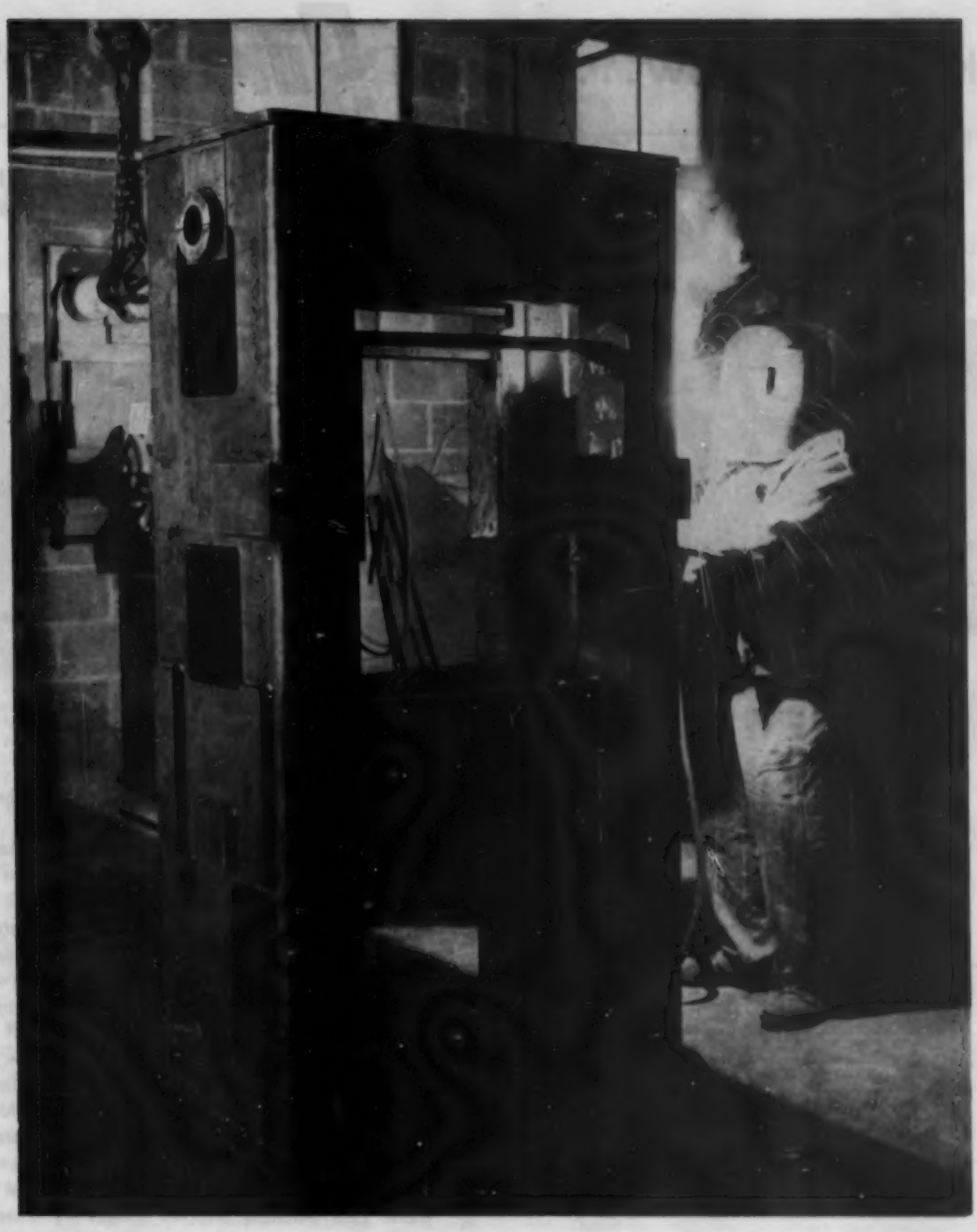
pressure drop. These diaphragm operated valves, manufactured by Eclipse Fuel Co., alternately hold and release a 27 to 29 in. mercury vacuum at a rate of 2 cycles per min. They are installed on either side of the vacuum storage tank, and are limit switch actuated.

Design of the valves provides several operating advantages. Valve disc diaphragm is synthetic rubber. Rim of the diaphragm serves as a gasket and assures correct alignment of solenoid plunger and valve disc thus eliminating the need for gaskets. There are only two moving parts—the solenoid plunger and the synthetic rubber diaphragm. Valves are pilot operated, with line pressure furnishing the activating forces. Power is required only to lift the solenoid plunger.

Metallizing Wood Patterns Extends Life Twenty-Fold

While clearing their wood pattern warehouse for use as much-needed office space, a southern foundry found that they had a collection of damaged wood patterns on

(Continued on page 112)



BETTER PRODUCTS AT LOWER COSTS- *by fabrication*

Photo above is all-steel punch press frame, Tho a third lighter than expensive castings it replaced, greater strength and rigidity of welded construction enable punch press to operate 50% faster.

Besides basic saving of material, plus values are reduced freight and handling costs, easier machining qualities. And future design changes can be made at nominal cost.

Because steel can be formed or cut into almost any size, shape or thickness, doubtless some of your own castings can be replaced by fabricated steel, at really worth-while savings.

Send us a print or a sketch of your product. Or if you wish our engineer will call on you. No obligation in either case.

THE FOSTER COMPANY, Saint Joseph, Mich.

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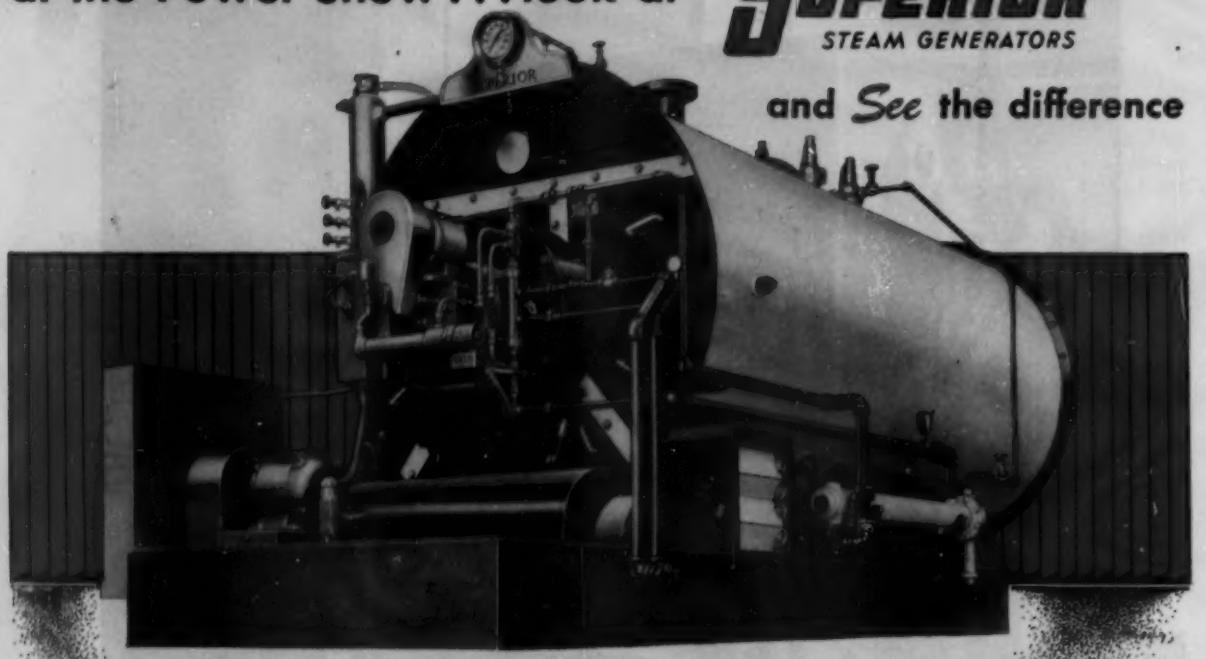
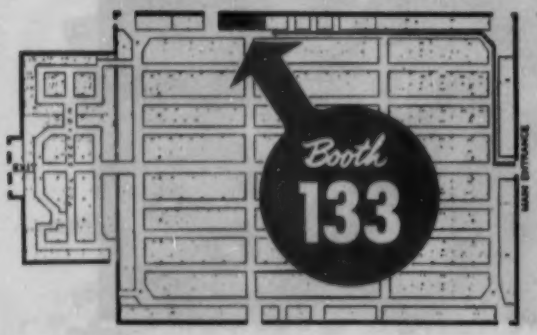
at the Power Show . . . look at SUPERIOR STEAM GENERATORS

and *See* the difference



HERE'S WHAT TO LOOK FOR:

POWER SHOW
DEC. 2nd through DEC. 7th



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Look . . . at Superior's 4-pass fire-tube design . . . ample heating surfaces with a minimum of 5 sq. ft. per b.h.p.

Look . . . at Superior's built-in multiple induced-draft fans . . . drawing evenly across the entire tube area, and eliminating the need for an expensive chimney.

Look . . . at Superior's Rotary Burner with its own fan supplying primary air . . . fully automatic with oil or gas, or both . . . change from either fuel to the other quickly, without dismantling equipment or interrupting steam supply.

Look . . . at Superior's safety features . . . induced draft which prevents the escape of combustion gases into the boiler room . . . fool-proof combustion gas pressure-relief port . . . constant gas pilot throughout gas firing periods . . . dual purging of all gas passages, both before and after firing.

Look . . . at the overall picture . . . a complete packaged steam plant. One purchase shipped completely assembled after factory test to assure dependable operation at a guaranteed thermal efficiency of more than 80%.

Look . . . at Superior's catalog for the complete story. If you're not going to the show, write for Catalog 602.

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SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

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readers' guide

. . . an index to advertised products

The table below lists, according to product groupings, all equipment advertised in this issue. To request more data, circle key numbers on Reply Cards, pages 34/35 & 98/99

Key No.	Advertiser	Product	Page No.
	AIR FILTERS & DUST COLLECTORS		
530	Western Precipitation Corp.	Fly ash recovery	41
	BOILERS & BOILER ACCESSORIES		
526	Ames Iron Works, Inc.	Packaged steam generator	37
509	Babcock & Wilcox Co., Boiler Division	Integral-furnace boiler	14-15
542	Bituminous Coal Institute	Coal	82
534	Cleaver-Brooks Co.	Self-contained boilers	45
552	Diamond Power Specialty Corp.	Multi-Port gauge	103
556	Engineer Co., The	Boiler baffles	107
547	Hapman-Dutton Co., Dutton Boiler Div.	Free steam cost calculator	96
508	Hays Corporation, The	Oxygen recorders	13
535	Heacon, Inc.	Dampers	46
567	Liquidometer Corp., The	Tank gages	117
572	Orr & Sembower, Inc.	Packaged automatic boilers	119
527	Peabody Engineering Corp.	PK-54 automatic burner	38
537	Petro	Industrial oil burners	48
549	Superior Combustion Industries, Inc.	Steam generators	98
521	Vogt Machine Co., Henry	Unit steam generators	31
	BUILDING MATERIALS & MAINTENANCE		
571	Flexrock Co.	Concrete floor patch	118
562	Smooth-On Mfg. Co.	Iron repair cement	113
529	Subox, Inc.	Paint system	40
	ELECTRICAL EQUIPMENT		
563	Acme Electric Corp.	Dry type transformers	114
513	Bussmann Mfg. Co.	Fuses	22-23
516	Economy Fuse & Mfg. Co.	Dual-element fuses	26
511	I-T-E Circuit Breaker Co.	Unit substations	18-19
525	U. S. Electrical Motors Inc.	Varidrive motor	35
	ENGINES & TURBINES		
541	Chicago Pneumatic Tool Co.	CP diesel	80
517	Coppus Engineering Corp.	Turbines	27
560	Murray Iron Works Co.	Turbines	111
	FILTERS, STRAINERS & PURIFIERS		
570	Ronningen Mfg. Co.	Filters	118
	HEAT EXCHANGERS & WATER HEATERS		
518	Niagara Blower Co.	Aero heat exchanger	28
510	Patterson-Kelley Co., Inc.	Copper-lined storage heaters	17
520	Pick Mfg. Co.	Hot water heaters	30
	HEATING, AIR CONDITIONING & REFRIGERATION		
566	Powers Regulator Co.	Temperature & humidity control	115
	INSTRUMENTS & CONTROLS		
523	Leslie Co.	Controllers	33
546	U. S. Gauge, Div. American Machine & Metals, Inc.	Gages	95
	LUBRICANTS & LUBRICATION EQUIPMENT		
555	Cook's Sons, Inc., Adam	Lubricants	106
514	Manzel Div. of Frontier Industries, Inc.	Force feed lubricators	24
551	New York & New Jersey Lubricant Co.	Non-fluid oil	102
538	Sinclair Refining Co.	Diesel lubricants	49
532	Standard Oil Co. (Indiana)	HD oil	43
540	Sun Oil Co.	Suntac oils	79
573	Texas Co., The	Ursa oil	120
	MATERIALS OF CONSTRUCTION		
524	Foster Co.	Fabrication	34
548	Foster Co.	Metal fabrication	97
544	Kirk & Blum Mfg. Co., The	Sheet metal fabrication	93
	MATERIALS HANDLING EQUIPMENT		
501	Link-Belt Co.	Coal handling equipment	3
	MECHANICAL POWER TRANSMISSION		
519	Dynamatic Div., Eaton Mfg. Co.	Eddy current equipment	29
554	Lovejoy Flexible Coupling Co.	Variable speed transmissions	108
536	Raybestos-Manhattan, Inc., Manhattan Rubber Div.	Condor whipcord belts	47
	PACKINGS AND GASKETS		
531	Johns-Manville Corp.	Gaskets	42
	PIPE, TUBING & HOSE		
553	Atlantic Metal Hose Co., Inc.	Flexible metal hose	104
569	Felt Products Mfg. Co.	Thread compound	117
565	Haas Bros., Inc.	Seal-all jointing compound	114
	PUMPS & COMPRESSORS		
545	Weinman Pump Mfg. Co., The	Centrifugal pumps	94
507	Worthington Corp., Compressor Div.	Compressors	11
506	Worthington Corp., Vertical Turbine Pump Div.	Vertical turbine pumps	10
	REFRACTORIES & INSULATION		
543	Babcock & Wilcox Co., Refractories Div.	Refractory concrete	91
	STEAM SPECIALTIES		
500	Armstrong Machine Works	Steam traps	2
539	Yarnall-Waring Co.	Impulse steam traps	50
	TOOLS		
558	Airetool Mfg. Co., The	Condenser tube cleaner	109
503	Proto Tools	Special tools	6
564	Thread-Ezy Mfg. Co.	Power pipe threader	114
	VALVES & REGULATORS		
561	Atlas Valve Co.	Pressure regulator	112
504	Chapman Valve Mfg. Co., The	Steel valves	7
528	Darling Valve & Mfg. Co.	Gate valves	39
559	Henszey Company	Flow meters	110
550	Keckley Co., O. C.	Pressure-temperature regulator	101
515	Spence Engineering Co., Inc.	Temperature regulators	25
	WATER TREATMENT & WASTE DISPOSAL		
505	Betz, W. H. & L. D.	Water conditioning	9
522	Bird-Archer Co., The	Water treatment	32
502	Cochrane Corp.	Demineralizers	4
568	Hungerford & Terry, Inc.	Water treatment plant	117
533	North American Mogul Products Co.	Water treatment	44
512	Rohm & Haas Co.	Water treatment	21

bulletins

. . . for listing of the bulletins just received see page 36

AIR CLEANING & DUST COLLECTION

250—Small Scale Dehydration

To meet the increased demand in engineering operations for small volumes of dry gases not warranting plant size installation, this company has developed the Hydryer, described in seven-page booklet. J. F. Pritchard & Co., Equipment Div.

251—Dust Collectors and Arrestors

Series of four folders describes cyclone type collector and portable, standard, and automatic bag-type dust arrestors. Also includes 32-page catalog describing exhaust fans for dust collecting and air handling. Northern Blower Co.

252—Industrial Dusts

"The Collection and Recovery of Industrial Dusts," 32-page manual 101, discusses various types of dust and techniques used in analysis, lists the factors which influence choice of equipment, and explains the operation of each type of collector. Buell Engineering Co., Inc.

253—Precipitation Equipment

Engineers contemplating the installation of equipment for recovering dusts, fly ash, fumes, mists, fogs, or other similar suspensions in stack or process gases will find much valuable data in this 40-page booklet. Western Precipitation Corp.

254—Electrical Precipitators

Booklet 2-ATC covers the history and fundamentals of electrical precipitators, design and construction, dimensions and capacities, electronic power supply, selenium power supply, and installation stories. The Aerotec Corp.

255—Tubular Dust Collectors

Booklets 2-PDC and 3-PDC on mechanical dust collectors cover capacities and efficiencies, dimensions, construction and the decantation method used on installations where re-injection of large, unburned high carbon particles is required for economy. Prat-Daniel Corp.

256—Industrial Dusts

Booklet 3-TTC gives a brief background of modern dust problems and an approach to their solution. Discussed are sources of dust, determining dust size, prediction, fly-ash emission codes, types of dust and methods of control. The Thermix Corp.

257—Dust and Fume Removal

This 19-page bulletin, 610, pictures and describes the standard units that go to make up the Multi-Wash System for the removal of air-borne dust, fumes, vapors, and odors. Claude B. Schneible Co.

258—Dust Collectors

Dust collectors, including cyclone, wet or dry dynamic, and cloth screen arrestor types are the subject of a 32-page bulletin. Uses of air conditioning, ventilating, conveying, drying, and cooling units are presented. Kirk & Blum Mfg. Co.

AIR CONDITIONING — HEATING & REFRIGERATION

259—Temperature, Moisture Control

Precision control of air temperature and moisture enable you to produce your product in any climate, at any season, according to six-page bulletin 122. The Type "A" air conditioner described, for drying or moistening of air, is shown in typical installations. Niagara Blower Co.

260—Propeller Fans

Three new models are among the 13 types of fans shown in 40-page bulletin A-109. It also describes three types of roof ventilators, unit heaters and intake air units, and includes specifications, dimensions, and performance figures on all equipment. Hartzell Propeller Fan Co.

261—Unit Heaters

Catalog CUH 846-A gives the complete story on Grid unit heaters. Catalog BC-1040 describes Grid blast coils for process drying. How the construction of the unit heaters prevents electrolytic corrosion is explained in booklet "Corrosion in Unit Heaters." D. J. Murray Manufacturing Co.

262—Steam Heating Systems

Five major types of steam heating systems, with and without control, and a full line of valves, traps, and steam power specialties are described in 19-page bulletin 110. It features the Selectotherm System which is an automatically controlled high vacuum steam heating system. Illinois Engineering Co., Div. of American Air Filter Co., Inc.

263—Woven Electric Heaters

Pre-Fab woven electric heaters are described in folder 1546 which illustrates typical uses and gives application data for this versatile heat source. Suggested uses such as for heating gearboxes, local comfort heating, and for preventing condensation are listed. Pre-Fab Heater Co., subsidiary of Ewin L. Wiegand Co.

BOILERS & STEAM

264—Vertical Unit Boiler

More than 25 years of development, manufacturing, and application experience are reflected in the design of the Type VU-10 vertical-unit boiler described in 16-page bulletin VU 10-8. Advantages and design features are discussed. Combustion Engineering, Inc.

265—Refuse and Wood Burning

Engineering data concerning spreader stokers installed to burn refuse or wood are contained in 24-page booklet 505. Stationary, manual dumping, power dumping, and traveling grate installations having maximum capacities from 10,000 to 275,000 lb steam per hr, steam or compressed air operated, are described. Detroit Stoker Co.

266—Boiler Controls

Specifications for the fully automatic, all electric metering type packaged control for shop assembled boilers are given in four-page folder 53-1068-239. Schematic drawing shows a typical packaged control system for a combination oil or gas fired boiler. The Hays Corp.

267—Simplified Boilers

The new line of simplified Powermaster packaged automatic boilers in sizes 15 through 100 hp, light oil or gas, are discussed in eight-page bulletin 1230. Details of design and construction, a cutaway view, and sample specifications are given. Orr & Sembower, Inc.

268—General Catalog

A wealth of research, engineering, and manufacturing experience, gained since the founding of this company in 1880, is incorporated in the products described in four-page folder. Steam generators, heat transfer equipment, pressure vessels, valves, and fittings are shown. Henry Vogt Machine Co.

269—Pressure Equipment

One of the country's oldest manufacturers of equipment and accessories for plants piping steam, air, and gas under

PRODUCT INDEX

Air Cleaning & Dust Collection 100
Air Conditioning — Heating & Refrigeration 100
Boilers & Steam 100
Building Materials & Maintenance ...102
Compressors & Blowers 103
Corrosion Control 103
Diesel & Gas Engines 103
Electrical Equipment 103
Electric Utilization 103
Heat Exchangers & Water Heaters ...103
Instruments & Controls 104
Lubrication 104
Materials Handling & Storage 104
Metals & Welding 104
Piping, Valves, & Specialties 105
Power Transmission — Mechanical 105
Pumps 106
Refractories & Insulation 106
Turbines & Steam Engines 106
Waste Disposal 107
Water Treatment 107

NOTE—Each bulletin has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 98/99.

pressure, has published catalog 400, covering its line of separators, traps, and boiler trim. A condensation of the information in catalogs 500, 600, and 700, the booklet gives technical data. Wright-Austin Co.

270—Boiler Replacement

"What Every Business Man Should Know About Boilers," has been prepared to give executives a better understanding of boilers and a realization of the tremendous loss that industry is taking due to obsolete and inefficient steam generating equipment. Chances are two to one that your boiler is obsolete, according to this 14-page booklet. Superior Combustion Industries, Inc.

271—Heated and Cooled Gages

Four-page data unit 237 covers special purpose heated and cooled gages and valves which are said to solve the problem of getting accurate level readings of liquids that boil or surge — or liquids that are heavy and don't flow at normal temperature. Jerguson Gage & Valve Co.

272—Coal-Burning Installation

"Burning Bituminous Coal the Modern Way," contains 24-pages of case histories from industries of all sizes and types. Engineering survey results for equipment such as boilers, stokers, coal and ash handling units, and automatic controls, include annual fuel consumption and operating costs. Bituminous Coal Institute.

273—Draft Inducers

The biggest contribution to the cause of improved furnace operation in recent years has been the mechanical draft inducer, according to 12-page booklet I-52. Six causes of poor chimney draft are listed. L. J. Wing Mfg. Co.

387—Liquid Level Indicator

Do you have to guess at your boiler water level? Nineteen-page booklet WG 1824 describes the Yarway Remote Liquid Level Indicator and shows how it is used not only for boiler water indication but for feed water and deaerating heaters, expansion tanks, hot flow softeners, and other similar uses. Yarnall-Waring Co.

274—Packaged Steam Generators

Construction of packaged steam generators is described in eight-page bulletin 1050. Auxiliary equipment is listed and a blueprint with dimensions of a typical boiler room is given. Ames Iron Works.

275—Coal Handling Equipment

Applications of coal handling equipment for the power plant, pictured in 40-page brochure 2410, illustrates the cumulative experience gained in thousands of installations over more than 75 years. Drawings show tested layouts for various operating conditions. Link-Belt Co.

276—Tube Cleaners

Bulletin 43 introduces a new geared tube cleaner for removing scale in heat exchanger and condenser tubes of ⅝ to 2½ in. ID. The unit is said to be particularly effective where conditions require low speed and extreme power. The Airetool Manufacturing Co.

277—Boiler Gaskets

Easy-reference flange gasket and boiler gasket dimension tables and bolting data are included in catalog AG-983. Shown are types for raised face, smooth face, crane-lap, and Van Stone joints, flange unions, male and female joints, and tongue and groove fittings for all standard makes of boilers. United States Gasket Co.

278—Small Capacity Boilers

Small boilers available in 15 to 40 hp for heating and processing are introduced in four-page bulletin AD-134. Advantages

THIS NEW KECKLEY REGULATING VALVE GIVES

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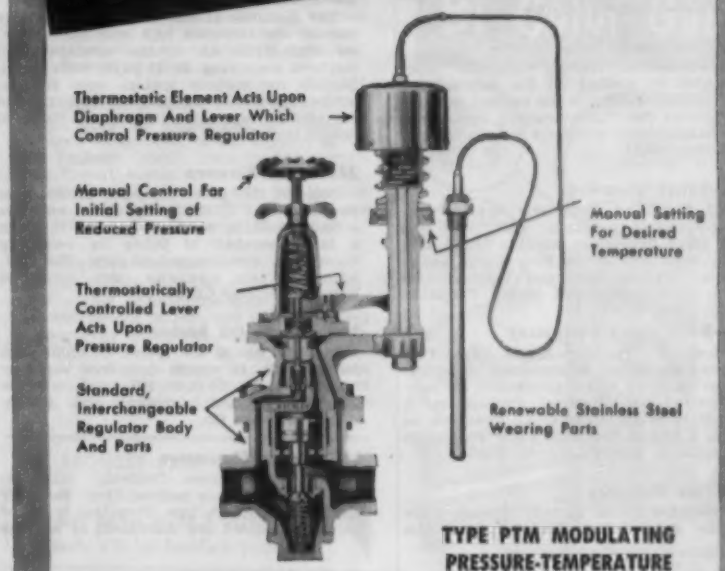
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Manual Control For Initial Setting of Reduced Pressure
Thermostatically Controlled Lever Acts Upon Pressure Regulator
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bulletins

—Starts on page 100

such as the new hinged front and rear doors, forced draft air system, four-pass construction, and electric control panel are shown. Cleaver-Brooks Co.

279—Condenser Tube Inserts

How to restore leaking condenser tubes to service by sealing off the deteriorated portion with inserts, is the subject of four-page leaflet 500. Tube cleaners, expanders, and maintenance tools are listed. Thomas C. Wilson, Inc.

280—Boiler Cleaning

Four fact-filled pamphlets explain how this company's products will help you solve algae problems, increase boiler efficiency with use of the Ever Clean boiler process, remove rust, and prevent corrosion. North American Mogul Products.

281—Boilers and Equipment

Sixteen-page bulletin SB-50, "Erie City Boilers and Allied Equipment," describes custom designed steam generators for central station or industrial application. A number of water tube types available as well as a line of fire tube waste heat units are pictured. Erie City Iron Works.

282—Flue Dampers

Booklet 1-HEA on curtain type dampers for flue gas control explains what the damper is and does, construction, dimensions, installations, and gives case histories. Booklet shows drawings and photos of a variety of damper types. Hexcon, Inc.

283—Tube Expanders

Rolling and flaring tube expanders and operating accessories are listed in eight-page catalog 62. Illustrations, specifications, and recommendations are included. The Gustav Wiedeke Co.

284—Atomizing Oil Burners

The cheapest grades of oil or tar can be completely atomized and efficiently burned with Type SA steam atomizing oil burners according to 16-page bulletin 21. Models for various special uses are described. Furnace design and construction for efficient operation is stressed. National Airoil Burner Co., Inc.

285—Soot Blowers

Bulletin 1137 gives complete information on the Model G9B blower which employs a fixed position rotating element to clean a large number of tubes by sweeping through a pre-determined arc. The bulletin suggests various uses. Diamond Power Specialty Corp.

286—Heavy-Oil Burner

Fuel savings is the theme of eight-page foldout AD-131 which describes the new "4" Hev-E-Oil burner. Illustrations show compactness and simplicity of design. Cleaver-Brooks Co.

287—Boiler Blowdown

"Boiler Blowdown Control," technical paper No. 128, is a reprint from **Industry and Power**, March 1954. Principal types of boiler blowdown are discussed, as well as various control methods necessary to assure production of pure steam and for keeping heat transfer surfaces free of objectionable deposits. W. H. & L. D. Betz.

288—Packaged Steam Generators

Basic construction and design features of plant assembled steam generators, with or without superheat, are presented in illustrated 20-page booklet P6-51-2. Includes tables of engineering specifications for units from 10,000 to 30,000 lb steam per hr and design pressures from 250 to 825 psi. Foster Wheeler Corp.

289—Power Plant Equipment

Custom engineered equipment for petroleum refineries, chemical plants, and power plants are pictured in use in these industries in 12-page bulletin E-1. Included are stills and towers, heat exchangers, and crystallizers. Henry Vogt Machine Co.

290—Boiler Baffles

"More Steam from Your Boilers," a four-page folder, explains how streamlined baffles are applied to all types and sizes of boilers. Drawings indicate how they are installed in units to secure crossflow of gases. The Engineer Co.

291—Automatic Burner

Newly designed automatic burner, model PK-54, for oil, gas, and oil or gas, is described in four-page folder 430. For capacities to 42,000 lb steam per hour, the burner is described as a complete, automatic combustion unit including blower and controls. Peabody Engineering Corp.

292—Boiler Service Valves

Surface blow, bottom blow-off, water column blow-off, and connections are covered in 22-page bulletin E125, with complete specifications, materials, and dimensions of each type. Valve operation is explained by illustration. Fire protection valves are included. Everlasting Valve Co.

293—Boilers & Stokers

Over 88 years experience are embodied in the design and construction of Scotch Marine type portable boilers says 28-page catalog. Photographs and cross-sections illustrate various models ranging in capacities from 6 hp up to 25 hp. Underfeed stokers for this type boiler are described. The James Leffel & Co.

294—Firing Equipment

Over 50 years of leadership in the manufacture of industrial-commercial firing equipment is reflected in 19-page general catalog 3048. Schematic drawings, layouts of typical installations, cutaway views of burners and burner parts, and photographs are included. Petro Division.

295—Combustion Processes

Too much or too little air can have costly effects in combustion processes. Bulletin "Oxygen-Index of Combustion Processes" points out that by using oxygen itself as the criterion to proper combustion, greater over-all efficiency, and economy are realized. Arnold O. Beckman, Inc.

BUILDING MATERIALS & MAINTENANCE

296—Thread Compound

A data sheet gives complete information on C-5 "Hi-Temp" thread compound. A sample will be sent along with the data sheet. Felt Products Manufacturing Co.

297—Flooring

"Handbook of Building Maintenance," gives valuable information on keeping your plant in efficient working order. Instant-Use concrete floor patch is described with suggestions for its use, along with

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To protect highly finished ball and roller bearings from failure due to acids in most greases, change to NON-FLUID OIL — and reduce your down time of costly equipment.

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other materials for repairing floors. Flexrock Company.

298—Repair Cements

Text and illustration in this 48-page handbook present repair methods for leaks in pipes, boilers, radiators, concrete, cinderblocks, and sheet and plate metal. Directory describes 12 repair cements and jobs they will do. Smooth-On Mfg. Co.

COMPRESSORS & BLOWERS

299—Compressors

Horizontal heavy duty air and gas compressors, Type T, are described in 15-page bulletin 728-8. Cross sections of crankshaft, inlet valve unloading system, compressor cylinder and valves, and the complete compressor add to the value of the booklet. Chicago Pneumatic Tool Co.

300—Rotary Compressors

Operation and construction of single-stage water-cooled rotary compressors and vacuum pumps, applicable to every air or gas handling requirement, are described in 12-page bulletin 16B8136. It gives general specifications along with typical air piping arrangement diagrams. Allis-Chalmers Mfg. Co.

CORROSION CONTROL

301—Transmission Line Corrosion

"Corrosion Control of Electrical Structures and Equipment," 17-pages, is designed to give practical painting information on all phases of transmission and distribution work. Subox, Inc.

DIESEL & GAS ENGINES

302—Dual Fuel Engines

In 36-page bulletin S-500-B737 are photographic examples of each application, together with vital statistics, case histories, and comments on fuel consumption for dual fuel engines. Each feature is treated separately. Worthington Corp.

ELECTRICAL EQUIPMENT

303—Air Circuit Breakers

Bulletin 5107-DR-1 contains four pages of facts, figures, features, and photographs on types KA, KB, KC, and LG Urelite air circuit breakers, and on weatherproof and dust-tight enclosures. I-T-E Circuit Breaker Co.

304—Power Transformers

Power transformers being built at the new mass production Rome, Ga. plant are described in 40-page booklet GEA-6108. It cites applications and features of standardized single phase and three phase units, ranging from 501 to 10,000 kva. General Electric Co.

305—Dry-Type Transformers

"Latest Developments in Dry-Type Transformers," seven-page catalog 153-A, presents the advantages of air-cooled units designed and constructed primarily for inside installations. Sorgel Electric Co.

306—Renewable Fuses

Sixteen-page bulletin S-40 describes the Economy DeLay renewable fuses which are said to give safe and dependable time-delay on overloads. For every requirement, these fuses have inexpensive links which are easily replaced. Economy Fuse & Manufacturing Co.

307—Power Factor Correction

Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. Typical wire connections are shown. Sprague Electric Co.

308—Circuit Breakers

"What You Should Know About Circuit Breakers," 16-page manual 101, explains the operating principles of basic circuit breaker design. Included are simplified diagrams of three basic types. Heinemann Electric Co.

309—Commutators and Slip Rings

"Commutator and Slip Ring Maintenance," 39-page handbook, covers trouble shooting, brush maintenance and operating procedure, and general maintenance. Illustrations show the operations described. Ideal Industries, Inc.

310—Light Dimming Equipment

Light dimming equipment, available as packaged assemblies, is the subject of 12-page bulletin D651P. Described are units for different numbers of circuits requiring up to 2000 w each, and for various types of a-c operation. Wiring diagrams are included. The Superior Electric Co.

311—Flexible Conduit

Extra flexible Sealtite conduit for electrical wiring of machine tools and industrial equipment is pictured and described in four-page pamphlet EF-531. It points out the fact that this liquid-tight, extra flexible conduit is approved for these uses by the Joint Industry Council, American Metal Hose Branch, American Brass Co.

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ELECTRIC UTILIZATION

312—Variable Speed Motors

How variable speed motors are used to improve production is described in 16-page brochure 1797. In addition to describing advantages the booklet describes design theory and construction features. U. S. Electrical Motors, Inc.

313—Motor Control Center

Savings in space and expense and improved performance is explained in 12-page bulletin 170. Electrical and constructional details of these groups of combination motor starters and their components are fully described. Arrow-Hart & Hegeman Electric Co.

314—Motors

Advantages of the various types of motors made by this company are given in four-page folder 23. Descriptions of single-phase and polyphase motors are included along with a listing of their specifications. Wagner Electric Corp.

HEAT EXCHANGERS & WATER HEATERS

315—Pipe and Fin Coils

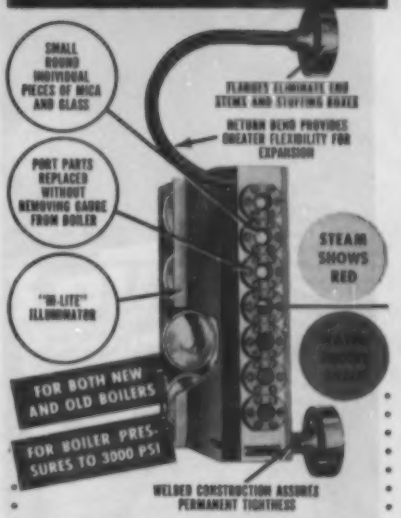
Revised second edition of the "Engineering Data Book on Pipe and Fin Coils" contains such information as calculation of pipe and fin coils, heat transfer coefficients for heating or cooling, and Btu load limitations for cooling coil circuits. Rempe Co.

316—Heat Exchangers

Bulletin 120 describes the operation of the Aero Heat Exchangers used in cooling or controlling of temperatures of industrial liquids. It shows the operation of this equipment by means of diagrams and

NEW

DIAMOND "MULTI-PORT" Bi-Color Gauge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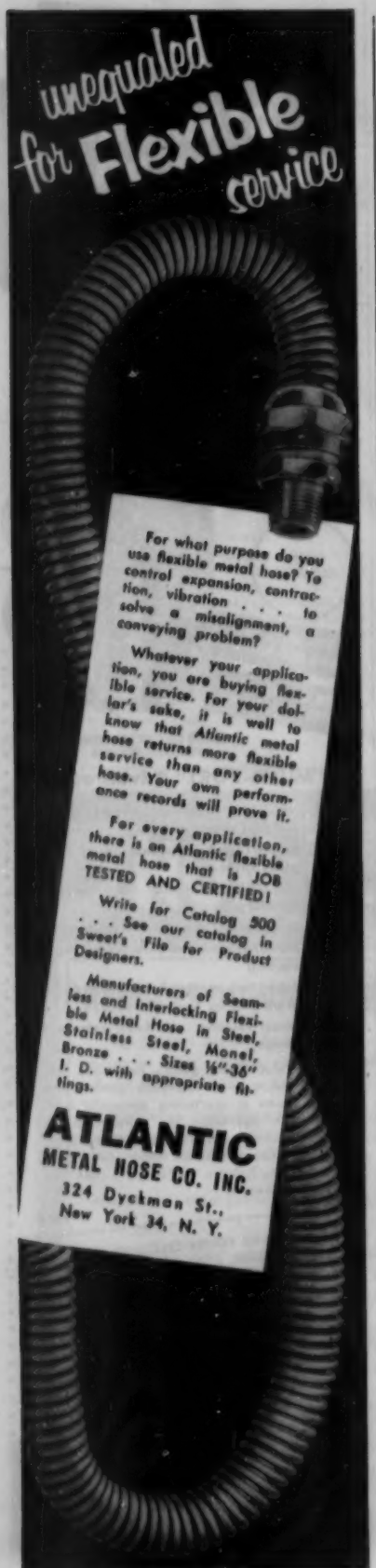
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bulletins

—Starts on page 100

examples of application by installation photographs. Niagara Blower Co.

317—Injection Water Heaters

Steam injection water heaters with the pressurizer piston for safe, quiet, automatic control are described in four-page pamphlet WH12A. How the unit saves space, time, fuel, and maintenance costs is explained. Pick Manufacturing Co.

318—Water Heaters

A streamlined system of heating water and process liquids quickly and at low cost is explained in this bulletin. The Instant Heater described eliminates the need for reducers. Cross-sectional drawings explain how unit operates. Johnson Corp.

319—Heaters

Horizontal and vertical heaters in steel, copper lined, copper-silicon, cement lined, clad and galvanized construction, as well as the low-flow design are each cataloged as to weights, dimensions, construction details, and capacities—with conversion tables, in 48-page catalog 18. The Patterson-Kelley Co., Inc.

INSTRUMENTS & CONTROLS

320—Gage Catalog

The four important questions to ask before you buy gages are listed in comprehensive 68-page catalog 64. Whether you need gages for replacement on operating equipment or for installation on new equipment, you will find complete information in this booklet. U.S. Gauge Div., American Machine and Metals, Inc.

321—Temperature Regulators

Bulletin 330 fully describes a simple, self-operating temperature regulator for plating, anodizing, bonderizing, pickling, cleaning and rinsing solutions. The Powers Regulator Co.

322—Temperature Regulators

Recommended installations of temperature regulators for instantaneous water heaters, storage water heaters, and forced air heating systems are shown in three line drawings in four-page folder 1008. Spence Engineering Co., Inc.

323—Temperature and Pressure Control

Through years of experience in instrument design and manufacture, this company has developed a specialized line of equipment for the recording and indicating of temperature and pressure. Seven-page bulletin G-158-A shows typical examples of such equipment with lists of specifications. The Electric Auto-Lite Co., Instrument and Gauge Div.

324—Flow Meters

With an alarm control, the flow meters described in this bulletin have only three moving parts. How they operate to ring a bell, light a light, or activate a motorized valve is explained by means of illustrations. Henszey Co.

388—Flow Meters

Important data on the Diaflow Meter, for measuring air flow, gas flow, and the ratio between the two flows, are presented in eight-page booklet 52-1017-37. According to the booklet, the meter is particularly well suited for industrial furnaces and also for sewage disposal plants. The Hays Corp.

LUBRICATION

325—Force Feed Lubricator

Automatic force feed lubricator Model "94" described in 11-page booklet 94-C will pump against any steam or air pressure up to 1500 lb and will handle any grade of oil from the lightest mineral to the heaviest cylinder stock. Manzel Div. of Frontier Industries.

326—Non-Fluid Oil

This instruction bulletin explains the uses and advantages of Non-Fluid Oil. According to this booklet, it cannot clog fittings, it lubricates until entirely consumed, and will not separate under pressure. A free testing sample of the oil will be sent with the literature. New York & New Jersey Lubricant Co.

327—Oil Reclaimer

Subject of four-page folder R-347 is a self-contained, compact oil reclaimer for keeping industrial oils free from contaminants. In addition to describing how the process works, the bulletin suggests applications. The Hilliard Corp.

328—Diesel Lubrication

Written for everyone interested in the lubrication of diesels, "Lubrication of Diesel Engines," has been revised as technical bulletin B-1, 48-pages. It discusses diesel principles and design, types of engines in use, operating cycles, accessories and choice of correct diesel lubricants. Sun Oil Co.

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389—Oil Filters

'Filters and Purifiers for Oil Circulating Systems,' 16-page reprint from the magazine "Lubrication" for March, 1954, discusses the contaminants encountered with oils in service and the detrimental effects associated with them. Oil oxidation and extraneous matter is listed. Selection of equipment and maintenance of the various types is fully discussed. The Texas Co.

329—Industrial Gear Lubricants

The new and improved line of extreme pressure industrial gear lubricants to replace Stanogear Leaded Lubricants and Stanogear EP Lubricants is discussed in six-page technical bulletin X-417. Every engineer with lubrication problems should have this booklet as general reference material. Standard Oil Co. (Indiana)

MATERIALS HANDLING & STORAGE

330—Storage Bins

If you specify vertical storage construction for handling flowable bulk materials, this ten-page foldout will help you visualize how this company's Super-Concrete Stave Storage Bins might meet your requirements. The Neff & Fry Co.

METALS & WELDING

331—Nickel Alloys

Helpful technical publications covering the many aspects of nickel alloys, and their applications, are listed in two bulletins. Instructions on how to order literature, free of charge, are included. The International Nickel Co., Inc.

PIPING, VALVES, & SPECIALTIES

332—Valves

Needle, globe, plug, check, relief, and special valves are described in 44-page catalog 352A. Units listed are made of various metals, and are suitable for instrumentation, processing industries, hydraulic systems, and industrial applications. Republic Manufacturing Co.

333—High and Low Pressure Valves

Catalog 10 describes List 960 and 990 valves. The 960 is for a pressure range of 2000 lb at 100 F to 380 lb at 1000 F. The 990 is for higher pressures. According to the booklet, these valves offer extra protection against excessive stress. Chapman Valve Manufacturing Co.

334—Rubber-Lined Pipe Joint

Nine-page handbook presents basic principle, design features, method of installation, plus parts and tools needed to utilize the Gaco rubber-lined pipe system. It compares cost of Gaco and flanged pipe installations. Gates Engineering Co.

335—Regulating Valves

Bulletin 1-A, 52 pages, gives complete information on a wide range of regulating valves for steam, water, air, gas, or oil. Illustrations, cross-sectional drawings, and specifications are included. Atlas Valve Co.

336—Prefabricated Conduit System

Introduced in four-page folder 5210 is a newly developed large diameter, prefabricated conduit system for protection of underground services. Prefabricated to job requirements, it contains piping for steam, condensate, water lines, fire lines, or process purposes all in place and insulated where required. The Ric-wil Co.

337—Trapping Practice

Engineers concerned with steam traps should find 48-page catalog J a valuable source of data on recommended trapping practice. A maintenance section covers installation, preventive maintenance, trouble shooting, and repair. Armstrong Machine Works.

338—Valve Catalog

The various types of valves made by this company are pictured by means of blue-print drawings, cross-sections, and photographs in bulletins 500—505, 508, and 600. Complete dimensions are listed in tables. W. S. Rockwell Co.

339—Separators & Purifiers

Live steam, exhaust steam, air and gas, and receiver type separators, and steam purifiers and exhaust heads are described in 24-page catalog 500. Charts give pressure drop, steam capacity, and air capacity. Wright-Austin Co.

340—Tank Calculator

Hydro-pneumatic tank calculator tells you instantly the best air-water ratio, most efficient pressure differential, exact amount withdrawn on any pressure drop, and resultant reserve. Printed on heavy board, the calculator operates on a slide rule principle. Automatic Control Co.

341—Pump Valves

Pump valves and graphite packings are described in 24-page brochure SC-510. Types, details of construction, design features, applications, how to order, and dimensions are included. Heaters for heating water by blending with steam are also presented. Sims Pump Valve Co., Inc.

342—Float Traps

If you are planning to install low, medium, or high pressure float or float and thermostatic traps, you will need this illustrated catalog sheet. According to the data sheet, once these valves are installed, there is no necessity for the breaking of any pipe connection for servicing. Hoffman Specialty Manufacturing Corp.

343—Mud Valves

Four-page folder 12-S points out the outstanding construction features for extra long service life and low maintenance of the 2000 psi W. P. and 3000 psi W. P. alloy steel mud valves. Interchangeability of parts is stressed along with simplicity of operation. Edward Valves, Inc., subsidiary of Rockwell Mfg. Co.

344—Welded Floats

Units made of stainless steel, Monel, and chrome plated steel, in spherical, eliptical, and cylindrical shapes are shown in eight-page bulletin 753. Sizes from 2 to 14 in. dia for pressures from vacuum to 4800 psi are listed with weights, buoyancies, and collapsing pressures. W. H. Nicholson & Co.

345—Pressure Pipe Coupling

Ring-Tite, the new coupling for Transite Pressure Pipe, is the subject of six-page folder TR-142A. It shows how the coupling goes together, points out installation time savings, and explains economies in service. Johns-Manville Corp.

Torque Wrenches

Both inch-pound and foot-pound torquers are described in this complete 68-page catalog. Types included are for a wide range of drive sizes with plain or ratchet head. **Please send requests directly to Proto Tool Co., Dept. IP, 2276Z Santa Fe Ave., Los Angeles 54, Calif., with 10c.**

346—Rubber Linings

Application of rubber lining to prevent corrosion of tanks, pipes, and valves is discussed and pictured in four-page folder. In addition, two-page reprint tells how rubber lining can stop circulating pipe corrosion. La Favorite Rubber Manufacturing Company.

POWER TRANSMISSIONS — MECHANICAL

347—Belt Conveyor Design

Engineering data required to design a belt conveyor for any application are presented in 86-page catalog 853. The booklet, published to serve as a handbook on conveyor design, states that many problems can be answered by using a standardized unit. The Jeffrey Mfg. Co.

348—Flexible Couplings

Flexible couplings which never require lubrication are shown in 19-page bulletin 1000. Valuable engineering data for each type of coupling are given in table form. Lovejoy Flexible Coupling Co.

349—Eddy-Current Machinery

"Basic Principles of Eddy-Current Machinery," a section of 15-page bulletin GBI, explains the fundamental principles of generating torque by means of eddy-current devices. Another section, "Characteristics of Rotating Equipment," contains engineering data. Dynamatic Corp.

350—Power Transmission

Eight-page foldout describes a new concept of power transmission — the Poly-V-Belt Drive. This drive is said to be a solution to matching problems and to provide greater changeability. Manhattan Rubber Div. of Raybestos-Manhattan Inc.

351—Rayon Belting

Transmission belting with rayon instead of cotton plies was proved in field applications for more than four years on jobs

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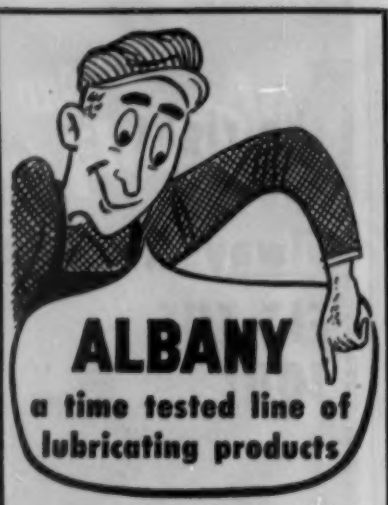

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bulletins

—Starts on page 100

specially selected for their severity according to four-page folder A5163W. Uses and advantages of Thor belting are listed. Goodyear Tire & Rubber Co.

352—Steel Collars

Steel shaft collars are shown in use on industrial lift trucks, printing presses, textile machinery, and other industrial equipment. Advantages of this type of collar are listed and a specification table is included. Standard Pressed Steel Co.

PUMPS

353—Turbo Pump

Each component of the type DE turbo pump is pictured and its design advantages explained in a six-page folder. The lubrication system is also described in detail. Typical uses are listed. The J. S. Coffin, Jr., Co.

354—Pump Package Systems

This catalog describes pump package systems including welded steel tanks in standard sizes of 50, 100, 175, 250, and 500 gal complete with all accessories. The Manajust Stroke adjustment for varying capacity when pump is not operating, and the Autajust for precise control of flow while pump is running are explained. Orchem Pump Div.

355—Proportioning Pumps

Design of the "K" pump, the result of long experience in the solution of proportioning problems, is shown in detail by means of a two-page foldout in five page bulletin KP-54. Capacity and pressure tables will help you choose the pump for your particular requirements. Hills-McCanna Co.

356—Opposed Impeller Pump

How opposed impellers balance axial thrust is covered in 12-page brochure 1502. Sizes from 2 to 4 in., with 2 to 8 stages, are presented for capacities to 1000 gpm, pressures to 1200 psig, and temperatures to 350 F. DeLaval Steam Turbine Co.

357—Packings

Darcova pumcups, which permit equipment to be operated at reduced speeds, are described in two bulletins: No. 4502 on Pumcups for air or hydraulic mechanisms; and 4401 on units for reciprocating pumps. Darling Valve & Mfg. Co.

358—Non-Clogging Pumps

Type U non-clogging pumps designed for handling liquids carrying large amounts of solids and foreign materials are described in 11-page bulletin 730-C. The specific uses of each type pump are given along with tables to help in selection. Weinman Pump Manufacturing Co.

359—Plunger Pumps

Graphically illustrated by photos, charts, and line drawings, 11-page bulletin W-44-B45 contains information about the VTE, VTE-1, and VTE-2 types of Plunger Pumps. Units are designed for application in fields such as the petroleum industry, flooding, and salt water disposal. Worthington Corp.

360—Pumps

Condensed catalog "M" describes pumps for every purpose. Among those described are: turbine type pumps for use with small capacities and high heads; and type 66U side suction centrifugal pumps. Aurora Pump Div. of New York Air Brake Co.

361—Package Feeder

Proportioning pumps and package chemical feeding units are described in this four-page folder. With liquid ends available for about 85 percent of all chemical pumping requirements, the pump is designed for use where a controlled capacity is necessary. Bird-Archer Co.

362—Rotary Gear Pumps

"How to Solve Pumping Problems," is the title of 36-page booklet 3060. In addition to presenting typical problems and their solutions, various types of rotary gear pumps are described. The major portion of the book is intended to serve as a data handbook. Geo. D. Roper Corp.

390—Pump Valves

Pump valves and graphite packings are described in 24-page brochure SC-516. Types, details of construction, design features, applications, how to order, and dimensions are included. Heaters for heating water by blending with steam are also presented. Sims Pump Valve Co., Inc.

REFRACTORIES & INSULATION

363—Refractories

Charts which show at a glance the properties of refractory castables, plastics and mortars are featured in 20-page catalog R-22. Important information including recommendations for each is presented. Babcock and Wilcox Co., Refractories Div.

364—Refractories & Insulation

Catalogs R-52 through L-93, compiled in a binder, form an illustrated 40-page booklet showing where, when, and how to use various types of materials for industrial heat generation and processing equipment. Refractory & Insulation Corp.

365—Heat Resistant Concrete

Useful engineering data and information pertinent to the structural design of refractory and heat-resistant concrete is contained in 12-page booklet PP-5M. Universal Atlas Cement Co., Lumnite Div.

366—Aluminum Jacketing

One of the most frequent problems in the use of aluminum jacketing on insulated lines is how ells, tees, and bends should be weatherproofed. Data Sheet E-130 presents three practical methods. Childers Manufacturing Co.

367—Industrial Insulation

"J-M Products for the Process Industries," eight pages, is arranged as a ready reference for men responsible for the design, installation, and operation of process equipment. Johns-Manville Corp.

TURBINES & STEAM ENGINES

368—Low-Cost Power

If you use steam for heating, cooking, or processing, you can get power at almost no cost with the use of a Wing steam turbine according to bulletin SW-1a. Construction of these units gives an almost infinite range of speeds, easy control by throttling, and the units are independent of any electric power failure. L. J. Wing Mfg. Co.

369—Steam Turbines

Fully-illustrated 24-page bulletin 1961 emphasizes the flexibility of design of the Type-S turbine which is said to make possible selection of the proper number of stages, governor, and controls to give

maximum efficiency for your steam and operating conditions. Worthington Corp.

370—Multi-Stage Turbines

Smaller framed, multi-stage turbines are featured in six-page bulletin. Overspeed governor, governor valves, blades, diaphragms, and many other design features are discussed and illustrated. The Terry Steam Turbine Co.

371—Turbine Speed Control

"Fundamentals of Turbine Speed Control," 32-page brochure H-21, is an educational piece intended to clarify the operation of common types of automatic speed control for steam turbines. Simplified diagrams illustrate operating principles of actual control systems. Elliott Co.

372—Steam Turbine Selection

Full details of this company's steam turbine are given in bulletin 135. Drawings and installation photographs point out the special features. How to save operating and maintenance costs by buying the right size for individual needs is explained. Coppus Engineering Corp.

WASTE DISPOSAL

373—Waste Treatment

How this company has solved waste treatment problems for such industries as electro-plating, refinery, gas, and metal finishing is treated in detail in six-page booklet 70-B. A handy bibliography serves as a reference for more information. Infilco, Inc.

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WATER TREATMENT

374—Water Analysis

Published by a company engaged exclusively in the solution of industrial water conditioning problems, this 14-page brochure contains brief descriptions of testing and control equipment necessary for the more common water analyses. W. H. & L. D. Betz.

375—Water Purification

"Boiler Feedwater Treatment," 19-page bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion-exchange by means of chemical formulas and flow diagrams. Hungerford & Terry, Inc.

376—Ion Exchangers

Strongly basic anion exchanger is presented in 16-page bulletin 57. Includes complete data on physical characteristics, exchange capacity and regeneration technique. National Aluminate Corp.

377—Mixed Bed Demineralizing

"Automatic Mixed-Bed Demineralizing at the Albany Steam Plant," eight-page bulletin 3083 tells the story of the first fully automatic mixed-bed equipment to produce make-up water. A table shows the comparative cost of an evaporator and a demineralizer. The Permutit Co.

378—Water Conditioning

Conditioning for boiler, process, and general application is discussed in 20-page booklet 611A. A zeolite unit for manual and automatic operation is featured. In addition, chemical feed, zeolite-post treatment, zeolite-alkalinity neutralization, split-stream, and anion exchange dealkalization systems are explained. Elgin-Refinite, Div. of Elgin Softener Corp.

379—Ion Exchangers

This 14-page booklet reviews generally the subject of ion exchange, established and potential applications. It gives advantages of the synthetic ion exchange resins and a bibliography of papers concerning their use. Rohm & Haas Co.

380—Water Softener

ZEO-FLO Sodium Zeolite Softener, a water softener specially designed for small and medium size industrial plants, laundries, and hospitals, is described in four-page folder 4305-A. How the softener has been simplified so that installation may be handled readily by the facilities of a small or medium sized plant is explained. Cochrane Corp.

381—pH Control

"Automatic pH Control in Water and Industrial Waste Treatment," eight pages, is a reissue of a paper delivered by R. T. Sheen, president of this company. Outlined are several typical systems of automatic pH control in boiler feed water treatment. Milton Roy Co.

382—Chlorinizers

Chlorination—the modern way to prevent slime buildup in condensers and heat exchangers—saves you money if its right. But if dosage is too heavy, you run the risk of corrosion, according to application memo 840-J9. Chlorinizers for feeding from a few pounds to 6000 pounds per day are described. Builders-Providence, Inc.

383—Demineralization

"Demineralization Including Silica Removal by Ion Exchange," 28-page booklet 3803, describes applications, principles of operation, and gives recommendations for demineralizing and silica removal apparatus and synthetic resins. The Permutit Co.

384—Boiler Water Treatment

Difficulties caused through industrial water contamination are outlined in a 12-page catalog. Recommended water conditioning treatments for scale, sludge, corrosion, carryover and other boiler conditions, and efficient control methods are described. E. F. Drew & Co., Inc.

385—Deaerators

Spray-atomizing type units are shown in cross-section in four-page booklet 400. Function, design and operation, construction, outstanding features, and uses are discussed. American Water Softener Co.

386—Boiler Water Foam

Laboratory pictures in this four-page folder show how Concentrol controls boiler water foam. Examples of its use in various industries are given along with an explanation of foaming. Bird-Archer Co.

391—Water Sampling

Are you sure you know the which, when, and where of obtaining samples for proper control of water conditions in your power plant? "Effective Water Sampling," folder 28X7969, gives concise information on each phase of water sampling. Allis-Chalmers Manufacturing Co.

392—Free Check-Up Service

SECA Report 30694 explains the service offered by this company whereby any make zeolite water softener will be checked by a field engineer, free of charge, and the results submitted to the owner of the equipment in exact figures and percentages showing just how efficient his equipment is, with recommendations of how to increase its usefulness. Elgin-Refinite, Div. of Elgin Softener Corp.

These important fuel-saving, maintenance-reducing features are obtainable with Enco boiler baffles — and only with Enco baffles.

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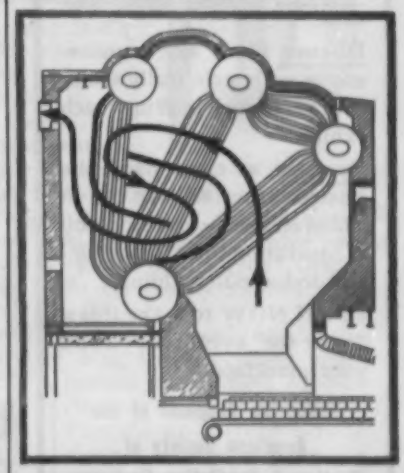

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names make news

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Bell & Gossett Co. announces election of four new vice presidents: **W. A. Boone,** who also becomes assistant treasurer; **H. W. Lockhart,** who continues as chief engineer; **R. A. Marquardt,** who continues as comptroller and assistant secretary; and **C. R. Smith,** who becomes vice president in charge of industrial relations.

I-T-E Circuit Breaker Co.—Jerome Corwin will head the new Design and Development Section on electro mechanical devices, servo mechanisms, and computers.

Corwin **Miller**

Nordberg Manufacturing Co. announces appointment of **Hans U. Lieberherr** as director of engineering, **Emil Grieshaber** as director of projects development, and **Ralph Miller** as consultant and director of supairthermal development and application.

American Brake Shoe Co. Sintermet Div. announces appointment of **Howard B. Huntress** as director of research.

Jones & Laughlin Steel Corp. — Julius E. Graf retires as chief engineer, effective October 1.

International Nickel Co., Inc., is establishing four new sections in the Development and Research Div. Sections are: constructional alloy steels **H. V. Beasley** in charge; electroplating **Clarence H. Sample** in charge; Inco Nickel alloys development **T. E. Kihlgren** in charge; and stainless steel and heat-resistant alloys **Dr. V. N. Krivobok** in charge. **F. L. LeQue** is vice president and manager.

Wagner Electric Corp.—George W. Brown, executive engineer, is elected a vice president in complete charge of the engineering and research divisions. He will also serve as a member of the executive committee.

The Texas Co. names **Dr. Wayne E. Kuhn** as general manager of newly created Research and Technical Dept.

Aluminum Co. of America — Joel Tompkins is transferred from his post as chief of the electrical division of the Research Laboratories at Massena, N. Y. to the central electrical engineering department in Pittsburgh. **Hazen E. House,** formerly senior staff engineer of the power division at Alcoa, Tenn., succeeds Tompkins in the Massena post.

Yarnall-Waring Co. has moved to larger quarters at Room 308, Machinery Hall Bldg., 549 W. Washington St., Chicago 6, Ill. **Mitchell Carson, Ray Peterson,** and **Gordon Wagner** have been added to the sales staff at the Chicago Office.

Federal Pacific Electric Co. has acquired the Gardner Electric Mfg. Co., San Francisco.
James J. Dugan is appointed Detroit district manager of the company.

American Machine & Foundry Co.— Joseph P. Costigan, formerly operations manager of Alloy Rods Co., is named works manager of AMF's Buffalo plant.

Quaker Rubber Corp., Div. of H. K. Porter Co., Inc., announces appointment of **Joseph Cleary** as plant engineer, responsible for specifications and design of all new equipment, and maintenance and repair of present plant facilities.

Marcus Transformer Co. has transfered its manufacturing operations to an enlarged plant in Rahway, New Jersey. The move consolidates under one roof the operation of two former plants in Hillside, New Jersey.

Rockwell Mfg. Co.—Howard J. Evans takes over as chief engineer and manager of the Central Gas Products Research and Development Dept., and **H. A. Altorfer** becomes chief engineer and manager of the Central Valve Research and Development Dept.

First Prize Design

American Society of Mechanical Engineers—For this design, symbolizing a nuclear energy cycle of the present superimposed on a Carnot thermodynamic cycle of the past, and their effect on the world in which we live, **Andrew T. Lemmens,** design engineer

with the Gleason Works, Rochester, N. Y., receives first prize in the contest to find a symbol and motto for the 75th anniversary celebration in 1955 of ASME. **David H. Ray,** retired mechanical engineer of North Tarrytown, N. Y. received top award for the motto, "By Truth and By Service."

Edwin L. Wiegand Co. appoints **Joseph L. Nelson** as design manager of the Specialty Products Div. in charge of product styling.

Nelson **Maddock**

Worthington Corp. — Edward R. Maddock becomes works manager of the Decatur, Alabama Works, succeeding **George P. Passmore,** who resumes his duties as assistant to the vice president in charge of manufacturing.

Chelsa Fan & Blower Co., Inc. announces promotion of **George C. Blew** as representative in Kansas City, Mo. He was formerly service manager at the Chelsa home office in Plainfield, New Jersey.

Graton & Knight Co.—Edward T. Rudman is named chief plant engineer of G & K and its subsidiary, International Packings Corp.

Babcock & Wilcox Co.—R. L. Chubb is appointed assistant district erector in the Chicago district of B & W.

B. F. Goodrich Co., Industrial Products Div., names **Willard Haas** as technical manager of hose.

National Research Corp. — Sydney Minault, formerly chief engineer, is promoted to works manager and is now responsible for both the production and engineering departments of the Equipment Div. **William O'Malley** is manager of engineering to succeed Minault.

Benjamin Electric Mfg. Co. appoints eight executives to new positions of responsibility: **George F. Niemann** as works manager; **Alva H. Meyer,** manager of manufacturing engineering; **Carle E. Rackley,** chief engineer; **Clement P. Mors,** general superintendent; **Henry A. Fichtge,** production manager; **Eric H. Church,** manager of industrial engineering; **Raleigh I. Klipstein,** plant engineer; and **James R. Chambers,** sales promotion and advertising manager.

Byron Jackson Co. announces appointment of **Ross Barrett** to head an expanded department responsible for public relations, advertising, and sales promotion.

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light weight...
quiet...
high speed...
fast cleaning...

the AIRETOOL CC-4325 Condenser Tube Cleaner

Now . . . a condenser tube cleaner that's lighter than ever . . . that makes cleaning completely choked tubes up to 1" a strictly one-man proposition! Easily hand-held . . . no cumbersome supporting rig needed. Extremely mobile and flexible in operation.

The CC-4325 is quiet; driven by a powerful two-stage, muffled, air motor with a built-in flushing system that insures cooler running of the drill. A quick shut-off sleeve valve controls the flushing agent, and a trigger type valve controls motor speed. When used with a carbide tip drill, the CC-4325 makes short work of cleaning tubes completely choked with hardest deposits.

The New CC-4325 Condenser Tube Cleaner is only one of the new developments of The Airetool Mfg. Co., for many years leaders in the field of tube cleaning and expansion tools. There's an Airetool tube cleaner and expander for every type of tubular construction . . . Write for complete details.

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How to protect electric systems from lightning

a practical guide showing best methods

Just Out

Here are the ways to avoid annoying and costly shutdowns from lightning! This new book shows you—in simple and easy to follow form — best methods in use of lightning arresters, in shielding, and in grounding lightning. With a minimum of math and theory, it gives you the means to early practical solutions of your lightning protection problems!

LIGHTNING PROTECTION FOR ELECTRIC SYSTEMS

By EDWARD BECK

Manager, Lightning Arrester Section Switchgear Distbn. Apparatus Eng., Westinghouse Elec. Corp.

310 pages, 6x9, 149 illus., $6.50

This clear and basic book points the way to fuller, surer lightning protection for electric systems and equipment. It shows the nature of lightning and its effects, various means of protection, how to select and apply arresters, and what conditions to look for to avoid trouble.

The author describes the different types of arresters, and explains the meanings of their ratings—along with their limitations. A special chapter covers the protective and follow current characteristics of lightning arresters for power and distribution apparatus, 2400 volts and higher, with a description of the characteristics, their significance, and test methods. You learn how to choose the type and rating of arrester for a particular job, how to locate, choose, and apply lightning arresters to protect power equipment, and how to use arresters in distribution apparatus.

Applications of arresters at high altitude, for protection of portable equipment, and other special jobs, are discussed, and the author includes a chapter on protection for secondary circuits and other low-voltage circuits. He discusses house circuits and control and signalling circuits.

The author gives a critical review of results of field research on the lightning arrester in service, and draws conclusions about the probability distribution of various characteristics. He discusses grounding — its importance as a link in protection from lightning, and also as a safety measure against high voltages caused by faults. The author backs his recommendations by explaining the fundamental behavior of traveling waves and how this influences the effect of lightning-protective devices.

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. . . of special interest

LIGHTNING PROTECTION FOR ELECTRIC SYSTEMS by Edward Beck; McGraw-Hill Book Company; 313 pages; $6.50. This book should prove a useful tool for electrical engineers who must cope daily with the problem of protecting transmission lines, distribution systems, transformers, and rotating electric machinery. This volume covers a complex electrical art in a smooth reading, almost lay fashion.

A familiar phenomenon since the dawn of mankind, lightning has remained a large mystery until contemporary times. Beck outlines the origin of lightning, factors controlling its severity and frequency of occurrence, and fundamental concepts of protection provided by shielding and lightning arresters.

By deliberately avoiding the more technical and mathematical aspects of the subject (which he has documented with frequent references to the literature), the author has managed to condense into 310 pages the latest knowledge in the art of lightning protection. A well-known authority in this field, Beck has effectively and accurately presented a digest of this specialized art in a complete manner—including latest practices and applicable standards in effect to the date of publication. Liberal use of simple diagrams, condensed tables, and excellent explanatory photographs (most of which are arranged on the same page or facing page of the pertinent text) adds to the effectiveness of the presentation.

A widening field for the application of lightning arresters is resulting from increases in voltage levels and from increasing dollar values represented by installed electrical equipment. Beck introduces the reader to the current and voltage wave forms of lightning, to the

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HENSZEY FLOW METERS *with Alarm Control*

RINGS A BELL—LIGHTS A LIGHT or ACTIVATES a MOTORIZED VALVE

There are only three moving parts in the HENSZEY FLOW METER — no breakdown due to complicated gears and mechanism. Goes right in the line — no additional supports. Indicates flow within 3% absolute accuracy, even with pulsating flow. Send for bulletin.

SOUND ALARM AT HIGH OR LOW FLOW!

Easy to set on face of switch — unaffected by dust, dirt or corrosion — no pitting or sticking.

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measurement of discharges, and to the most recent research. The research of particular importance is that seeking to relate the arresters' abilities to the breakdown characteristics of the protected equipments' insulation. Beck clarifies the fundamental differences between the two basic types of arresters—expulsion type and valve type.

Statistical charts reveal the high degree of reliability in protection afforded against lightning and surges when lightning arresters are properly selected and applied. The author concludes with a chapter on traveling waves. With a minimum use of mathematics he presents clearly and concisely the concept of voltage build-up on lines due to reflections and shows how the proper use of lightning arresters limits this rise to safe values.

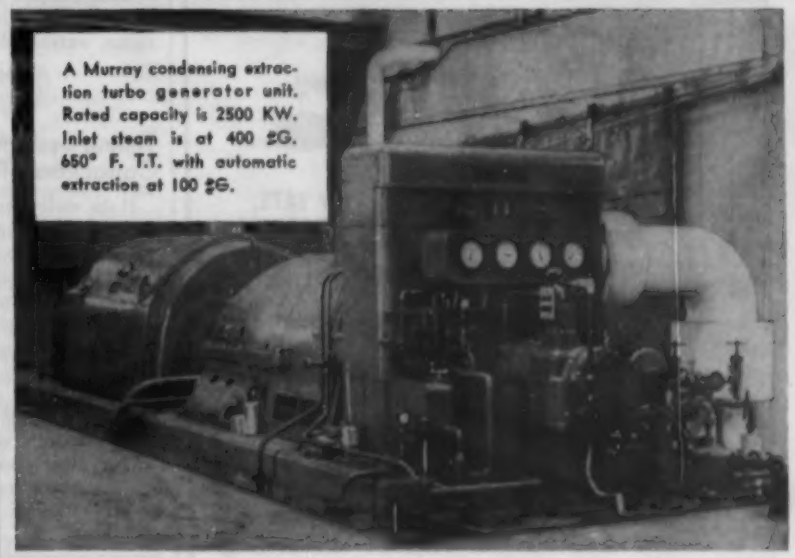
ALSO AVAILABLE

OIL AND GAS ENGINE POWER COSTS—1953; The American Society of Mechanical Engineers; 52 pages; $2.50. This is the twenty-fifth annual report of Oil and Gas Engine Power Costs, a book which has been considered an essential part of the library of every engineer who deals regularly with the operation of larger internal combustion engines. The major portion of the book is made up of tables presenting information on production costs, comparative costs from 1929 through 1951, and engine details and operating information. The tables deal with low speed stationary generating plants.

PROCEEDINGS OF THE NATIONAL ELECTRONICS CONFERENCE, 1953, Volume IX, National Electronics Conference; 922 pages; $5.00. This book contains all the technical papers and addresses presented at the 1953 National Electronics Conference. The 98 technical papers cover electronic research, development, and applications in audio circuits, communication, computers, electron tubes, filters, instrumentation, magnetic amplifiers, materials and components, microphonics, microwaves, network synthesis, nucleonics, servomechanisms, television, and transitors.

AMERICAN STANDARD REQUIREMENTS FOR TRANSFORMERS; American Standards Association; $1.00. The Standard for transformers has been "on trial" since March 1952. Suggestions from users, manufacturers, and others who have employed the proposed Standard are included in this book. The Standards presented will enable users to buy standard designs weighing as much as 30 tons and costing up to $45,000 or more each. Manufacturers estimate that more than $100,000,000 in transformers of ratings covered by the Standard will be sold in the next three years.

Murray Turbines



A Murray condensing extraction turbo generator unit. Rated capacity is 2500 KW. Inlet steam is at 400 #G. 650° F. T.T. with automatic extraction at 100 #G.

● Murray Turbo Generator units can be furnished to meet your special requirements in sizes up to 3000 KW. Condensing and non-condensing types with or without extraction and/or mixed pressure features can be furnished. Whether you require a small inexpensive standby unit or a highly efficient, and reliable source of power, Murray has a design to fit your needs.

Consult your local Murray representative who will gladly help you select the unit most economically suited to your conditions.

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TRADE MARK REG.

This ATLAS regulator maintains pressure without variation—regardless of fluctuating demand or varying initial pressures. Regulates steam—air—gas—in fractions of one pound to atmosphere—or higher—in one stage. It is known as the

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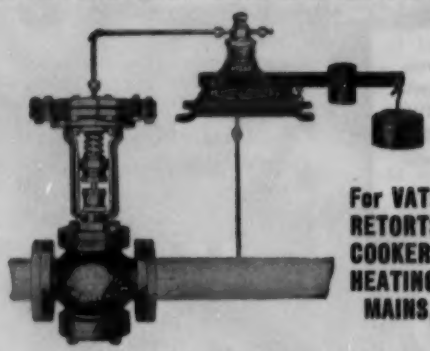
Super-Sensitive
PRESSURE REGULATOR



For VATS, RETORTS, COOKERS, HEATING MAINS, ETC.

If you want to maintain a constant level in an open tank, or, if you want a constant delivery pressure from a pump —this regulator is equally suitable. In fact its use in the pressure regulating field is unlimited. It operates diaphragm control valves of any size.

The use of water pressure gives this regulator ample power to close the control valve absolutely tight so that on dead end service there is no creeping or increase in the controlled pressure. The renewable composition disc makes it easy to keep the valve tight under the most exacting service.

When Ordering

Give the size of control valve (½" to 12"), initial pressure, controlled pressure, and the available water pressure for operating the regulator.

For Reduced Pressures	Specify
2 to 15 lb.	No. 801
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15 to 150 lb.	No. 802

Bulletin No. 1-B

This bulletin fully illustrates and describes the above as well as the ATLAS Compound Super-Sensitive Pressure Regulator. Ask for a copy. If you have regulating problems of any kind, ATLAS engineers will be glad to work with you.

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

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Represented in Principal Cities

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ideas in action

—Starts on page 92

their hands and very little space in which to store them. It was decided to try to repair the patterns and put them back in use.

Patterns that had been eroded by the heavy impact of the sand slinger were discarded. Although patterns had three coats of shellac, this erosion shortened the useful life of the wood to an average of only 50 castings.

Damaged patterns were cleaned, dents filled with wood cement, and broken pieces replaced. Steel wool and emery paper were used to remove glaze. Instead of applying shellac, as before, a metallizing gun spread on 0.0005 in. of zinc to seal the pores and over this a 0.025 in. coat of aluminum. The finished work was then hand sanded to produce the desired surface.

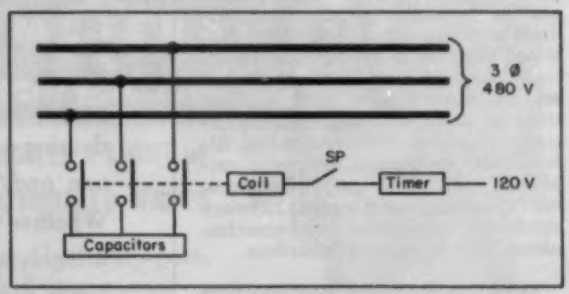
This simple metallizing technique not only put old patterns back in service, but, when used on new patterns, extended their life to 1000 castings.

Timing System Switches Capacitors off Line Automatically

It is well known that with capacitors on lines that are not carrying a load, voltage rises and power factor goes from a lag to a lead. A rise of a few volts on incandescent lamp circuits shortens the life of the lamps considerably.

At the Hyster Company's Peoria, Ill. plant, two main switch boards each switch to five power panel boards that are located in different work areas. Capacitors are installed above each of these panel boards. This system saves $400 to $500 a month, but it was found that part of the savings were eaten up by relamping.

The maintenance department, which is responsible for switching capacitors off the line when the plant or any area of the plant is not operating, decided to



Timing system provides manual or automatic switching.

use some sort of timing device to eliminate the element of human error. The system, now in use, consists of a 125-v, 24-hr cycle timer, two on and off trips, a magnetic switch with a 125-v coil, and a single pole lighting switch.

As shown in the diagram, the magnetic switch is cut in between the manual switch and the capacitors. The relaying side of the timer is connected to the holding coil in series with the single pole switch. By use of this switch the magnetic switch can be made inoperative at any time without stopping the timer, which is

preset to the working time in that particular area.

The plant has a total of 315 kvar in capacitors, placed in units of 30 and 45 in various work areas. Power factor with capacitors is .92 to .94. Putting the capacitors in use only when needed is saving Hyster about $75.00 a month in relamping.

Rouge Added to Oil Increases Bearing Load Carrying Capacity

Load-carrying capacity of copper-lead and aluminum sleeve type bearings has been increased more than 100 percent by adding fine rouge (1-micron particles) to the lubricating oil in research conducted at the University of Texas.

H. G. Rylander and E. M. Wight, both associated with the University, reported in a paper presented before the ASME fall meeting that rouge improved the finish under low load conditions before the high loads were successfully applied.

Tests with oil containing red rouge (1 micron), molybdenum sulfide (39 microns), or corundum (6 and 22 microns) were performed on bearings with a commercial finish as received.

Molybdenum sulfide (being marketed as a lubricant in various vehicles under a number of trade names) was found to have good anti-seizing properties. This material lowered the critical Z/P ratio but did not lower the coefficient of friction in the region of film lubrication. It was most effective on copper-lead bearings, which have a relatively rough surface compared with aluminum bearings. Load capacity was increased 60 percent with the addition of ½ gram per gal to lubricating oil. No significant improvement was noted in the use of the material with the softer Babbitt bearings.

Small amounts of 6-micron corundum increased friction of clean oil about four times in aluminum and copper-lead bearings. Action of 22-micron corundum was to roughen the bearing surfaces. Wear under all loads was rapid when corundum particles were larger than oil film thickness.

Copies of the paper, No. 54-F-11, may be obtained at 50 cents each from Order Dept., ASME, 29 W. 39th Street, New York 18, N. Y.

Tests Rate Turbine Lubricants For High Temperature Use

With the trend toward turbines operating with higher temperature steam, the development of a satisfactory nonflammable lubricant is becoming increasingly important. Present lubricating oils will ignite on contact with metal surfaces at 670 F while turbines are now being built to operate with steam at 1100/1050 F.

Dr. G. V. Browning and Peter G. Ipsen, General Electric engineers, in a paper presented before the American Society of Mechanical Engineers' fall meeting, proposed specifications for an acceptable nonflammable lubricant and listed several now available that would be satisfactory on the basis of nonflammability alone. These included perfluorinated hydro-carbons, tricresyl, phosphate, tetradichlorodiphenyl, and perhaps polymethyl phenylsiloxanes and water-based fluids.

However, perfluorinated carbons are limited by poor viscosity-temperature dependence properties and by their high cost. Chlorinated compounds that have been

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- Assembling parts
- Tightening loose screws, bolts, parts, handles, etc.
- Repairing worn or corroded metal areas
- Stopping leaks in boilers, pipe lines, pressure containers, etc.
- Making all kinds of emergency repairs

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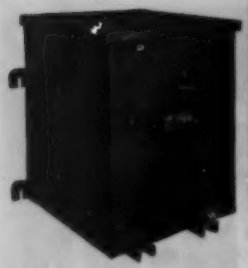

HOW TO USE
DRY TYPE
TRANSFORMERS
PROFITABLY
IN YOUR PLANT

Planning the electrical system of your plant with Acme Electric dry type transformers can save you money, material and time. How to eliminate double wiring, provide 3-wire secondary circuits, insulate circuits or balance voltage are only a few of the many ways you can use Acme Electric dry type transformers. Write for the folder DT 195 containing ideas and wiring diagrams. Acme Electric transformers are available in single phase sizes from 1/10 thru 500 KVA; three phase from 3 thru 750 KVA.

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TRANSFORMERS

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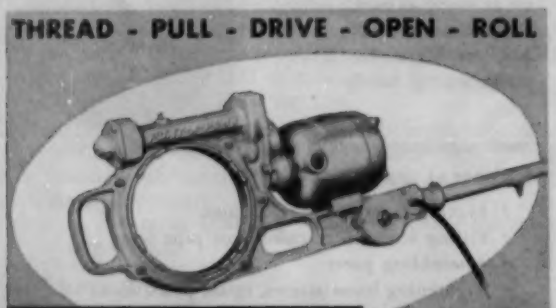
THREAD - PULL - DRIVE - OPEN - ROLL



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*PORT-A-PONY weighs 26 lbs.

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ideas in action

—Starts on page 92

tested are corrosive in the presence of water. The phosphate esters appear to hydrolyze with sludge formation, and silicones are insufficiently nonflammable. The water-based fluids show up a low rate of flame transfer and, in at least one formulation, have passed the ASTM oxidation test.

Continued research to resolve problems associated with loss of water by evaporation and gain in water caused by a possible steam leak are listed as objectives of immediate urgency. Work is now being done on development of tests that will give a more accurate evaluation of flame-transfer characteristics of fluids.

Copies of this paper, "Evaluation of Nonflammable Fluids as Steam-Turbine Lubricant," No. 54-F-36, may be obtained for 50 cents a copy from Order Dept., ASME, 29 West 39th St., New York 18, N. Y.

Procurement and Deferred Payment Plans Designed to Ease Management Headaches

Two new services recently announced are aimed at saving time and money. The first, a free service for customers of copper and brass warehousemen, will help to avoid costly delays in locating hard-to-find shapes, and sizes, and special alloys of copper-base products.

Members of the Copper and Brass Warehouse Association, Inc., working through the Association, will pool information on specialty items. If the local warehouseman doesn't have the particular shape or alloy the customer needs, he will call or wire C & B W A headquarters. The product will then be listed in the Association bulletin and any member able to supply the product will wire the member who needs it.

Under this plan, a user should be able to get his order filled in little more than a week.

The second service is a deferred payment plan offered by Surface Combustion Corp. for the purchase of industrial equipment. Products covered include furnaces for metal working and producing industries and the glass industry, and Kathabar humidity conditioning equipment.

Payment terms are up to three years and in certain cases up to five years with a down payment of 25 per-

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JOINTING
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TIME PROVEN APPLICATIONS

Oil Joints	Sealing Instruments
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SEAL-ALL is a highly viscous compound that can be easily applied to all threaded joints and flanges quickly, cheaply and effectively. It eliminates the need of packing washers and intermediary gaskets.

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cent of the purchase price. Charges are six percent simple interest on the unpaid balance.

According to Surface Combustion, advantage of deferred payment are many: working capital can be used for other requirements; interest costs are tax deductible as operating expenses; and cost savings afforded by use of new, modern equipment may be sufficient to pay for the equipment over the financing term. For more information contact Surface Combustion Corp., 2375 Dorr St., Toledo 1, Ohio.

Free Check-Up Service Offered For Water Softeners

Prompted by a survey which showed that far too many water softeners in use today are operating considerably below normal efficiency, Elgin-Refinite, Div. of Elgin Softener Corp., Elgin, Ill. is offering a water softener check-up service without cost or obligation.

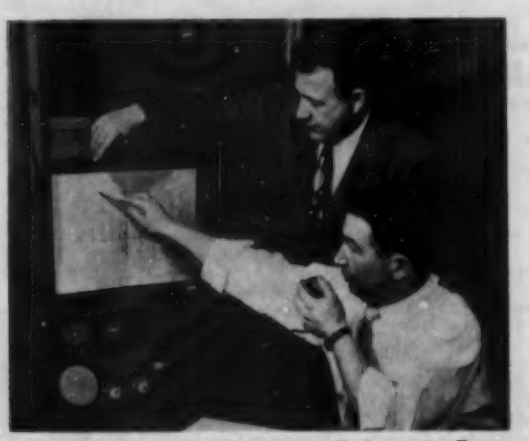
Any make zeolite water softener will be checked thoroughly by a competent field engineer who will submit his findings to the owner in a SECA Report (Softener Efficiency Cost Analysis). This report will show in exact figures and percentages what kind of a job the equipment is doing and point out what to do in case of inefficient operation.

For further information please write to Elgin-Refinite, Dept. IP, 138 N. Grove Ave., Elgin, Ill. and ask for SECA Report 50694.

Materials Handling Aided By Use of Two-Way Radios

Two-way shortwave radio-telephone sets installed in the cabs of electric fork-lift trucks at Chrysler Corporation's new Indianapolis plant are assuring prompt delivery of many tons of materials that are fed daily to production lines.

Together with a network of overhead conveyors and craneways, these trucks feed raw stock and unfinished



Dispatcher operates from centrally-located office.

materials to 1600 production machines which turn out parts and assemblies for Chrysler's fully-automatic PowerFlite transmissions for Plymouth, Dodge, DeSoto, Chrysler, and Imperial cars. The fork-lift trucks also transport machined precision parts to the various locations in the plant where they are assembled into completed transmissions.

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...with their 60 years of experience installing pneumatic systems of temperature and humidity control in all types of important buildings are well qualified to help you obtain the greatest return from an investment in — **ACCURATE UNIFORM CONTROL** in all types of heated or air conditioned spaces—offices, factories, process rooms, processes, research and test laboratories, packaging or storage rooms. You can gain...

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meetings

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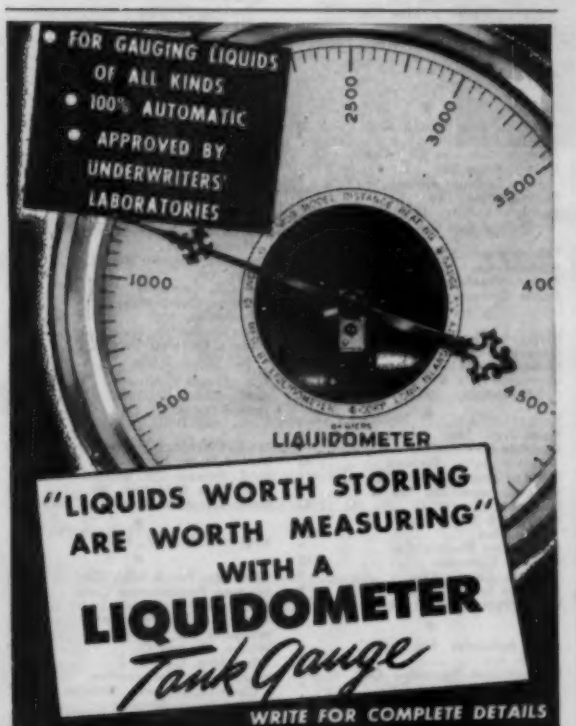
Nov. 18-19	National Association of Corrosion Engineers (Western Regional Conf.)	Los Angeles, Calif.
Nov. 28-Dec. 3	American Society of Mechanical Engineers (Annual Meeting)	Hotel Statler New York, N. Y.
Nov. 29-Dec. 2	1st International Automation Exposition	242nd C. A. Armory New York, N. Y.
Dec. 2-7	American Society of Mechanical Engineers (Power Show)	Commercial Museum Philadelphia, Pa.
Dec. 12-15	American Institute of Chemical Engineers (Annual Meeting)	Hotel Statler New York, N. Y.
Jan. 24-27	Plant Maintenance and Engineering Show (Exposition and Conf.)	Int'l Amphitheater Chicago, Ill.
Jan. 24-28	American Society of Heating and Vent. Engrs. (15th Int'l Exposition)	Commercial Museum Philadelphia, Pa.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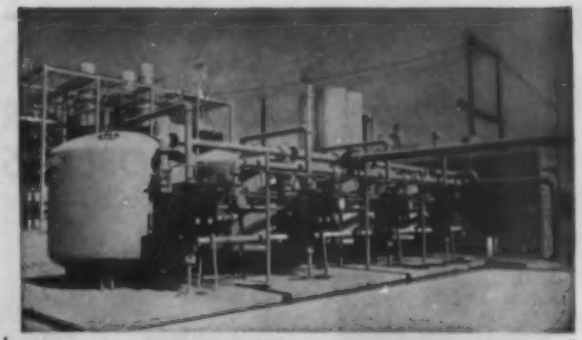

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✓ eliminates pitting of stainless steel

NO MORE FROZEN OR GALLED STUDS EVEN AT 1800°F

Let us SEND you a
FREE SAMPLE
so you can PROVE to YOURSELF that C-5 will lick your toughest stud breakage problems!

To assure easy maintenance on products having threaded assemblies many leading product engineers have specified the use of Fel-Pro C-5 as an anti-seize coating on stud threads prior to final production line assembly.

Fel-Pro's exclusive Colloidal-Copper formula allows for easy separation and reduces stud breakage of threaded assemblies after long exposures to extreme temperatures. It eliminates pitting of stainless and alloy steel even where dissimilar metals are joined.

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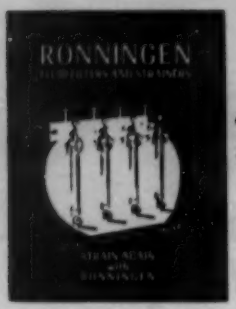
How Mills overcome IRON WATER PROBLEMS



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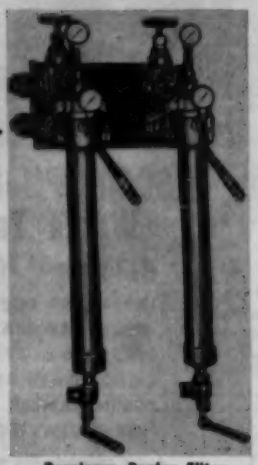

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These units are non short-circuiting, and have sealed ends that keep out foreign matter. Monel metal basket may be toured out.

Write for Bulletin No. 654MC

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"Particles large or small, we FILTER them all"

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Repair broken factory floors without the usual traffic tie-up. Simply shovel INSTANT-USE into hole or rut—tamp smooth—truck over! No Waiting! INSTANT-USE bonds tight to old concrete—right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

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INSTANT-USE

FLEXROCK COMPANY (Offices in principal cities)
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advertisers' index

Acme Electric Corp. 114
Aerotec Corp. ..... *
Air Conditioning Exposition 108
Airetool Mfg. Co. 109
American Metal Hose Branch, The American Brass Co. ..... *
Ames Iron Works, Inc. 37
Armstrong Machine Works 2
Arrow-Hart & Hegeman Electric Co. ..... *
Atlantic Metal Hose Co. 104
Atlas Valve Co. 112
Aurora Pump Co. ..... *

Babcock & Wilcox Co., The, Boiler Division 14-15
Refractories Division 91
Baico Industrial Equipment Div., Inc. ..... *
Bell & Zoller Coal Co. ..... *
Belz, W. H. & L. D. 9
Bird-Archer Co., The 32
Bituminous Coal Institute 82
Buell Engineering Co. ..... *
Burgess-Manning Co. ..... *
Bussmann Mfg. Co. 22-23

Chapman Valve Mfg. Co., The .. 7
Chesapeake & Ohio Railway ..... *
Chicago Pneumatic Tool Co. 80
Childers Mfg. Co. ..... *
Cleaver-Brooks Co. 45
Cochrane Corp. 4
Coe Mfg. Co. ..... *
Combustion Engineering, Inc. ... *
Cook's Sons, Inc., Adam 106
Coppus Engineering Corp. 27
Cyclotherm Div. of U. S. Radiator Corp. ..... *

Darling Valve & Mfg. Co. 39
Dart Union Co. ..... *
Dearborn Chemical Co. ..... *
DeLaval Steam Turbine Co. ..... *
Detroit Stoker Co. ..... *
Diamond Power Specialty Corp. 103
Dynamatic Division, Eaton Mfg. Co. 29

Economy Fuse & Mfg. Co. 26
Edward Valves, Inc. ..... *
Electric Auto-Lite Co., The ..... *
Elgin-Refinite Div., Elgin Softener Corp. ..... *
Engineer Co., The 107
Everlasting Valve Co. ..... *

Felt Products Mfg. Co. 117
Flexrock Co. 118
Foster Wheeler Corp. ..... *
Foster Company 34, 97

Gates Rubber Co., The ..... *
General Coal Co. ..... *
General Filter Co. ..... *
Goodyear Tire & Rubber Co., Inc. ..... *

Haas Bros., Inc. 114
Hapman-Dutton Co., Dutton Boiler Division 96
Hartzell Propeller Fan Co. ..... *
Hays Corporation, The 13
Heacon, Inc. 46
Heating & Ventilating Exposition 108
Heinemann Electric Co. ..... *
Henszey Company 110
Hilliard Corp., The ..... *
Hoffman Specialty Mfg. Corp. .. *
Hungerford & Terry, Inc. 117

Ideal Industries, Inc. ..... *
Infilco, Inc. ..... *
International Exposition Co. 108
International Nickel Co. ..... *
I-T-E Circuit Breaker Co. 18-19

Jeffrey Mfg. Co. ..... *
Jerguson Gage & Valve Co. ..... *
Johns Manville Corp. 42
Johnson Corp., The ..... *

Kackley Co., O. C. 101
Kirk & Blum Mfg. Co., The 93

La Favorite Rubber Mfg. Co., Inc. ..... *
Laffel & Co., The James ..... *
Leslie Co. 33
Lewellen Mfg. Co. ..... *
Link-Belt Co. 3
Liquidometer Corp., The 117
Lovejoy Flexible Coupling Co. .. 105

Mamal Div. of Frontier Industries, Inc. 24
Murray Mfg. Co., D. J. ..... *
Murray Iron Works Co. 111

National Airoil Burner Co. ..... *
National Aluminate Corp. ..... *
New York & New Jersey Lubricant Co. 102
Niagara Blower Co. 28
Nicholson & Co., W. H. ..... *
Nordberg Mfg. Co. ..... *
North American Mogul Products Co. 44
Northern Blower Co. ..... *

Orcham Pump Division ..... *
Orr & Sembower, Inc. 119

Patterson-Kelley Co., Inc. 17
Peabody Engineering Corp. 38
Permutit Company, The ..... *
Petro 48
Pick Mfg. Co. 30
Powers Regulator Co. 115
Pratt Daniel Corp. ..... *
Proto Tools 6

Raybestos-Manhattan, Inc. Packing Division ..... *
Manhattan Rubber Division 47
Refractory & Insulation Corp. ... *
Republic Mfg. Co. ..... *
Rie-wil Company ..... *
Rockwell Co., W. S. ..... *
Rohm and Haas Company 21
Ronningen Mfg. Co. 118

Shaw Co., Benjamin F. ..... *
Sims Pump Valve Co., Inc. ..... *
Sinclair Refining Co. 49
Smooth-On Mfg. Co. 113
Spence Engineering Co., Inc. ... 25
Sprague Electric Co. ..... *
Standard Oil Company (Indiana) 43
Standard Pressed Steel Co. ..... *
Subox, Inc. 40
Sun Oil Company 79
Superior Combustion Industries, Inc. 98
Superior Electric Co. ..... *
Sweet's Catalog Service ..... *

Terry Steam Turbine Co., The .... *
Texas Company, The 120
Thread-Ezy Mfg. Co. 114

U. S. Electrical Motors, Inc. 35
United States Gasket Co. ..... *
U. S. Gauge, Div. of American Machine & Metals, Inc. 95
Universal Atlas Cement Co. ... *

Vogt Machine Co., Henry 31

Weinman Pump Mfg. Co. 94
Western Precipitation Corp. 41
Wickes Boiler Co. ..... *
Wiedecke Co., The Gustav ..... *
Wiegand Co., Edwin L. ..... *
Wilson, Thomas C. ..... *
Wing Mfg. Co., L. J. ..... *
Worthington Corporation, Centrifugal Pump Division .... *
Compressor Division 11
Steam-Turbine Division ..... *
Vertical Turbine Division 10
Wright Austin Co. ..... *

Yarnall-Waring Co. 50

Where an * appears after the name the advertisement does not appear in this issue, but appeared in one or both of the two previous issues.

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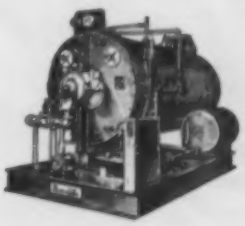
O·S Powermaster® PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



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